1995-1997 MARYLAND BIOLOGICAL STREAM SURVEY

RESULTS FOR SELECTED SMALL WATERSHEDS

CHESAPEAKE BAY AND WATERSHED PROGRAMS
MONITORING AND NON-TIDAL ASSESSMENT
CBWP-MANTA- EA-00-1

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1995-1997 MARYLAND BIOLOGICAL STREAM SURVEY RESULTS FOR SELECTED SMALL WATERSHEDS

Prepared for

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FOREWORD

This report, *1995-1997 Maryland Biological Stream Survey Results for Selected Small Watersheds*, supports the Maryland Department of Natural Resources' Maryland Biological Stream Survey (MBSS) under the direction of Dr. Ronald Klauda and Mr. Paul Kazyak of the Monitoring and Non-Tidal Assessment Division. This report was prepared under Maryland's Power Plant Research Program(Contract No. PR-96-055-001 to Versar, Inc.). A major goal of the MBSS is to assess the impacts of acidic deposition on Maryland's headwater streams and their biological resources. The MBSS is also designed to characterize and assess biological, physical habitat, and water quality conditions of streams throughout the entire state and in the major drainage basins, based on a three-year implementation schedule (1995-1997). This report presents additional results for selected small watersheds (defined as Maryland 8-digit watersheds) throughout the State. It reports on the extent (based on the percentage of stream miles) of seven major anthropogenic stressors in each watershed. It also reports the percentage of stream miles in each watershed characterized as degraded based on fish and benthic Indices of Biotic Integrity.

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1. BACKGROUND

The Maryland Biological Stream Survey (MBSS or the Survey) is a comprehensive program of the Maryland Department of Natural Resources (DNR) with the following goals:

- to assess the status of biological resources in Maryland's non-tidal streams;
- to quantify the extent to which acidic deposition has affected or may be affecting critical biological resources in the state;
- to examine which other water chemistry, physical habitat, and land use factors are important in explaining the current status of biological resources in streams;
- to establish a benchmark for long-term monitoring of trends in these resources; and
- to target future local-scale assessments and mitigation measures needed to restore degraded biological resources.

To meet these and other objectives, the Survey has established a list of questions of interest to environmental decision makers to guide its design, implementation, and analysis. These questions fall into three categories: (1) characterizing biological resources and ecological conditions (such as the number of fish in a given area or the number of stream miles with pH < 5), (2) assessing the condition of these resources (as deviation from minimally impacted expectations), and (3) identifying likely sources of degradation (by delineating relationships between biological conditions and anthropogenic stresses).

To achieve these objectives, 955 75-m segments were sampled in first- through third-order streams throughout the state during the Survey's first round in 1995-1997. Field data collected included information on water chemistry, physical habitat, and populations of benthic macroinvertebrates, game and nongame fish, amphibians and reptiles, mussels, and aquatic vegetation. Regional land cover data (MRLC 1996) were used to characterize catchment land uses. Using the fish and benthic macroinvertebrate data collected, fish and benthic Indices of Biotic Integrity (IBIs; see Roth et al. 2000 and Stribling et al. 1998) were calculated in order to further characterize the biotic condition at each site. For more information concerning stream conditions at the statewide and basinwide levels, see the report entitled *State of the Streams: 1995-1997 Maryland Biological Stream Survey Results* (Roth et al. 1999b).

In addition to results at the state and basin level, State natural resource managers have identified a need for assessment information for smaller watershed units. This report presents the results of the 1995-1997 MBSS for selected watersheds (defined as the 138 Maryland 8-digit watersheds) in each of the major drainage basins throughout the state. It quantifies the extent (expressed as the percentage of stream miles) of each of seven major anthropogenic stressors on stream water quality in each watershed containing four or more 1995-1997 MBSS sites. Note that

only 80 of the 138 Maryland 8-digit watersheds include four or more MBSS sites (including those watersheds sampled in multiple years). It also presents the percentage of stream miles rated poor or very poor (IBI score < 3.0) by the fish and benthic IBIs in each of these watersheds. These estimates can help in targeting potentially degraded watersheds within the major drainage basins for further field sampling and analysis. Fish and benthic IBI results at this scale also provide critical information to DNR, the Maryland Department of the Environment (MDE), and others seeking to develop biological criteria (as part of state water quality standards) and subsequently identify waters as candidates for 303d listing (those not attaining state water quality standards).

2. SAMPLE FRAME

The 1995-1997 MBSS sampling was designed to provide estimates of stream parameters for the entire state and within each of the 17 major drainage basins. Sample sizes were selected to yield estimates with small variance and good confidence at the statewide and basinwide level. Streams were stratified by stream order (first- through third-order), and sampling segments were randomly selected from each basin. Statewide, an approximately equal number of segments were selected from each of the three stream orders. Within each basin, the number of segments selected for a particular order was proportional to the number of stream miles in the basin, compared with other basins. The calculation of estimates and their standard errors incorporates weighting by stream order, so that they are representative of all stream miles in the basin of concern. For details on the sample design and methods for calculating estimates, see Roth et al. (1999b).

While statewide and basinwide estimates are for assessing the extent of stream conditions (e.g., percentage of stream miles rated as "poor" by the fish IBI or the percentage of stream miles affected by acidic deposition) across the entire state, identifying specific stream problems and targeting restoration efforts often require estimates for smaller watershed units. Within Maryland, major drainage basins are subdivided hierarchically into 8-digit watersheds (totaling 138, with an average area of 90 square miles) and 12-digit watersheds (totaling 1,166, with an average area of 11 square miles) for a variety of management purposes.

Although the 1995-1997 MBSS sampling was designed to provide basin estimates, the statistical routines for estimating parameters and errors were adapted to produce estimates at the 8-digit watershed scale. Estimates were calculated for 80 watersheds (all watersheds with at least 4 sites sampled), although variance analysis later showed that a minimum of approximately 10 sites is needed in many cases to produce estimates with acceptable precision. Estimates included means and percentages of stream miles for a number of parameters, with standard errors. Appropriate stream order weightings were incorporated using the actual proportion of stream miles in each stream order within each watershed and the number of selected sites by stream order within the watershed (Cochran 1977, equation 5.12). Ratio estimators were used when some sites in a watershed were unsampleable; ratios were based on the proportion of sampleable and unsampleable sites in the watershed, by stream order (Cochran 1977, equation 5A.72). When all sites are sampleable, equation 5A.72 reduces to 5.12. Sites with special reasons for exclusion (no fish IBI at sites with catchment area < 300 acres, brook trout or backwater streams that would score fish IBI < 3, or benthic samples with low abundance due to sampling difficulties) were not used in analysis and were considered as "unsampleable" for the purposes of these calculations.

Figure 2-1 is a map of the 138 Maryland 8-digit watersheds and their location in the State. Table 2-1 lists all 8-digit watersheds by name, number, code, and the basin in which each watershed is located. The table also contains the number of spring and summer 1995-1997 MBSS sites

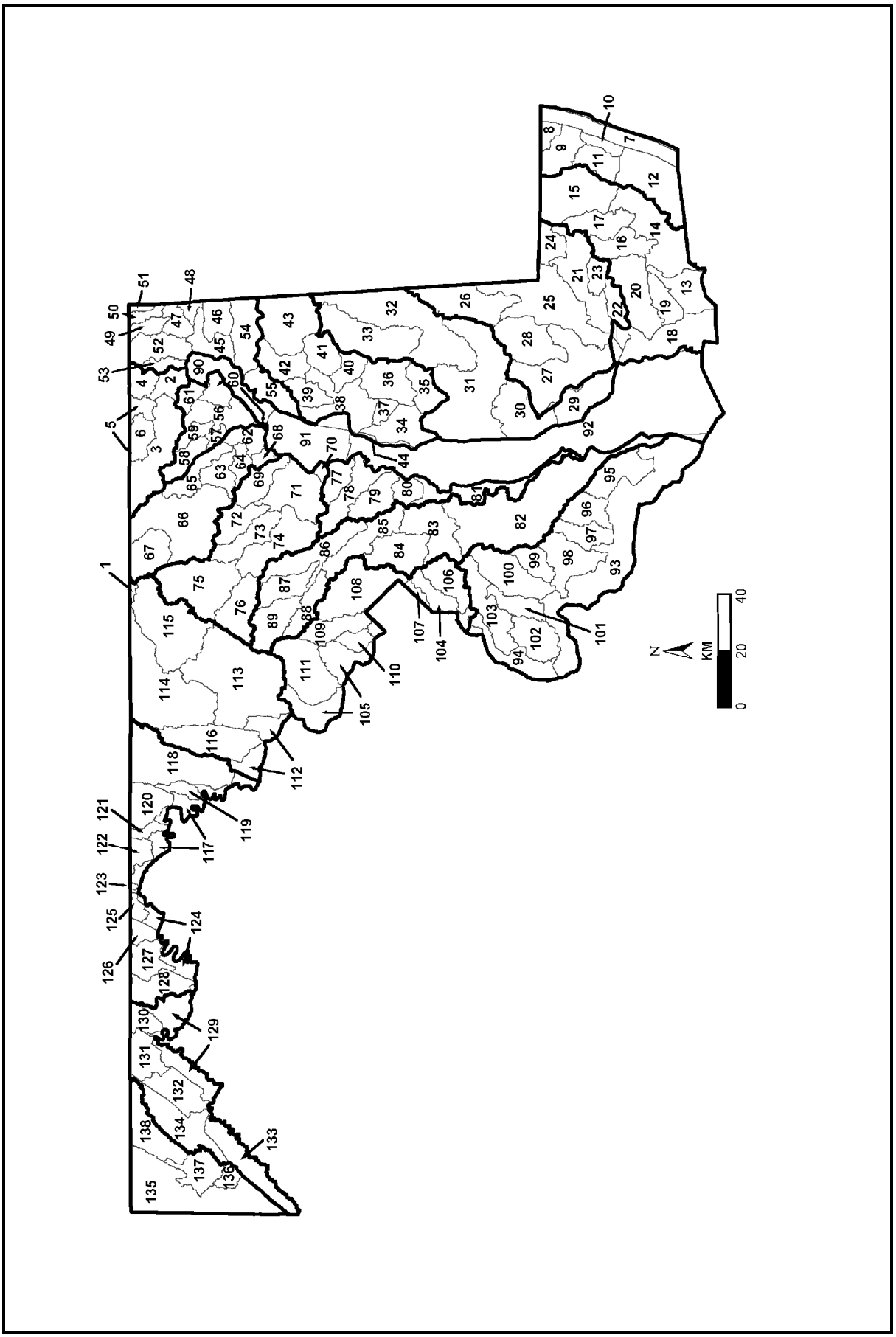


Figure 2-1. 138 Maryland 8-digit watersheds

sampled in each watershed, the size of the watershed in acres, and the number of non-tidal stream miles in each watershed. Owing to sampling difficulties (i.e., ephemeral streams or the presence of a beaver dam), fewer sites were sampled in the summer than in the spring for some watersheds. Because the confidence in any statistical estimate of condition declines rapidly with decreasing sample size, only those watersheds containing four or more 1995-1997 MBSS spring sites were analyzed in this report. Those watersheds, a total of 80, are noted with an asterisk in Table 2-1.

Table 2-1. Maryland 8-digit watersheds. An asterisk indicates that the watershed contains four or more 1995-1997 MBSS sites and is included in the estimates presented in this report.

Map Number	Watershed Code	Watershed Name	Basin	Number of Spring Sites	Number of Summer Sites	Watershed Area (acres)	Number of Non-Tidal Stream Miles
1	02050301	Conewago Creek	Conewago	0	0	3,393	0.00
2	02120201	L Susquehanna River	Susquehanna	3	3	24,420	25.87
3	02120202	Deer Creek*	Susquehanna	18	18	93,162	142.62
4	02120203	Octoraro Creek*	Susquehanna	5	5	22,243	36.41
5	02120204	Conowingo Dam Susquehanna R.*	Susquehanna	4	4	14,777	13.33
6	02120205	Broad Creek*	Susquehanna	7	5	26,123	46.84
7	02130101	Atlantic Ocean	Ocean Coastal	0	0	59,399	0.00
8	02130102	Assawoman Bay	Ocean Coastal	0	0	12,802	0.00
9	02130103	Isle of Wight Bay	Ocean Coastal	0	0	41,121	17.60
10	02130104	Sinepuxent Bay	Ocean Coastal	0	0	13,711	0.00
11	02130105	Newport Bay	Ocean Coastal	0	0	32,489	11.60
12	02130106	Chincoteague Bay	Ocean Coastal	0	0	89,297	11.11
13	02130201	Pocomoke Sound	Pocomoke	2	1	46,075	6.57
14	02130202	Lower Pocomoke River	Pocomoke	2	1	101,354	35.69
15	02130203	Upper Pocomoke River*	Pocomoke	24	22	95,595	109.65
16	02130204	Dividing Creek	Pocomoke	0	0	39,699	38.60
17	02130205	Nassawango Creek	Pocomoke	3	2	43,875	41.06
18	02130206	Tangier Sound	Pocomoke	0	0	89,661	0.00
19	02130207	Big Annemessex River	Pocomoke	0	0	29,818	4.17
20	02130208	Manokin River	Pocomoke	2	2	74,309	27.32
21	02130301	Lower Wicomico River*	Nanticoke/Wicomico	4	3	79,774	37.16
22	02130302	Monie Bay	Nanticoke/Wicomico	0	0	29,579	4.05
23	02130303	Wicomico Creek	Nanticoke/Wicomico	1	1	19,961	8.61
24	02130304	Wicomico River Head	Nanticoke/Wicomico	3	3	24,990	31.66

Table 2-1. (Continued)

Map Number	Watershed Code	Watershed Name	Basin	Number of Spring Sites	Number of Summer Sites	Watershed Area (acres)	Number of Non-Tidal Stream Miles
25	02130305	Nanticoke River*	Nanticoke/Wicomico	4	4	127,781	46.00
26	02130306	Marshyhope Creek*	Nanticoke/Wicomico	5	5	78,912	61.86
27	02130307	Fishing Bay	Nanticoke/Wicomico	0	0	130,090	13.36
28	02130308	Transquaking River	Nanticoke/Wicomico	1	1	70,392	26.97
29	02130401	Honga River	Choptank	0	0	52,731	0.00
30	02130402	Little Choptank	Choptank	0	0	69,693	2.26
31	02130403	Lower Choptank - 1996	Choptank	2	1	195,676	26.60
31	02130403	Lower Choptank - 1997*	Choptank	4	3	195,676	26.60
32	02130404	Upper Choptank - 1996*	Choptank	9	7	163,702	127.02
32	02030404	Upper Choptank - 1997*	Choptank	14	9	163,702	127.02
33	02130405	Tuckahoe Creek - 1996*	Choptank	10	10	98,282	90.31
33	02130405	Tuckahoe Creek - 1997*	Choptank	7	7	98,282	90.31
34	02130501	Eastern Bay	Chester	0	0	52,071	0.00
35	02130502	Miles River	Chester	0	0	34,859	12.06
36	02130503	Wye River*	Chester	4	4	56,996	38.46
37	02130504	Kent Narrows	Chester	0	0	12,647	0.00
38	02130505	Lower Chester River	Chester	2	2	82,237	17.72
39	02130506	Langford Creek	Chester	1	1	27,031	20.89
40	02130507	Corsica River*	Chester	6	6	25,302	33.68
41	02130508	Southeast Creek*	Chester	6	5	35,455	36.81
42	02130509	Middle Chester River	Chester	2	2	39,951	48.19
43	02130510	Upper Chester River*	Chester	21	19	87,985	78.24
44	02130511	Kent Island Bay	Chester	0	0	5,756	0.00
45	02130601	Lower Elk River	Elk	0	0	32,461	3.32
46	02130602	Bohemia River	Elk	1	1	29,710	14.23

Table 2-1. (Continued)

Map Number	Watershed Code	Watershed Name	Basin	Number of Spring Sites	Number of Summer Sites	Watershed Area (acres)	Number of Non-Tidal Stream Miles
47	02130603	Upper Elk River	Elk	0	0	22,234	6.87
48	02130604	Back Creek	Elk	0	0	9,515	1.65
49	02130605	Little Elk Creek	Elk	3	3	15,728	18.61
50	02130606	Big Elk Creek*	Elk	4	4	10,947	10.81
51	02130607	Christina River	Elk	1	1	5,319	7.49
52	02130608	Northeast River*	Elk	6	6	44,422	43.21
53	02130609	Furnace Bay	Elk	3	3	14,099	19.24
54	02130610	Sassafras River	Elk	0	0	56,944	27.63
55	02130611	Stillpond-Fairlee	Elk	0	0	40,913	37.47
56	02130701	Bush River	Bush	2	2	45,831	40.98
57	02130702	Lower Winters Run	Bush	3	3	8,469	16.36
58	02130703	Atkisson Reservoir*	Bush	6	6	29,075	52.69
59	02130704	Bynum Run*	Bush	5	5	14,584	28.96
60	02130705	Aberdeen Proving Ground	Bush	1	0	21,625	24.74
61	02130706	Swan Creek	Bush	3	3	16,863	22.13
62	02130801	Gunpowder River	Gunpowder	0	0	24,971	4.63
63	02130802	Lower Gunpowder Falls	Gunpowder	3	3	29,238	43.09
64	02130803	Bird River	Gunpowder	0	0	17,737	17.79
65	02130804	Little Gunpowder Falls*	Gunpowder	8	8	37,339	73.67
66	02130805	Loch Raven Reservoir*	Gunpowder	25	25	140,921	237.10
67	02130806	Prettyboy Reservoir*	Gunpowder	9	9	46,456	85.48
68	02130807	Middle River - Browns	Gunpowder	0	0	9,453	0.00
69	02130901	Back River - 1995*	Patapsco	4	4	39,127	41.88
69	02130901	Back River - 1996*	Patapsco	8	8	39,127	41.88
70	02130902	Bodkin Creek - 1995	Patapsco	0	0	6,577	4.44

Table 2-1. (Continued)

Map Number	Watershed Code	Watershed Name	Basin	Number of Spring Sites	Number of Summer Sites	Watershed Area (acres)	Number of Non-Tidal Stream Miles
70	02130902	Bodkin Creek - 1996	Patapsco	0	0	6,577	4.44
71	02130903	Baltimore Harbor - 1995*	Patapsco	4	4	74,897	46.53
71	02130903	Baltimore Harbor - 1996*	Patapsco	4	4	74,897	46.53
72	02130904	Jones Falls - 1995*	Patapsco	5	5	37,281	52.76
72	02130904	Jones Falls - 1996*	Patapsco	5	5	37,281	52.76
73	02130905	Gwynns Falls - 1995*	Patapsco	4	4	41,708	58.75
73	02130905	Gwynns Falls - 1996*	Patapsco	12	12	41,708	58.75
74	02130906	Patapsco River Lower North Branch - 1995*	Patapsco	14	14	75,754	129.50
74	02130906	Patapsco River Lower North Branch - 1996	Patapsco	3	3	75,754	129.50
75	02130907	Liberty Reservoir - 1995*	Patapsco	19	19	104,803	184.08
75	02130907	Liberty Reservoir - 1996*	Patapsco	18	18	104,803	184.08
76	02130908	S Branch Patapsco - 1995*	Patapsco	11	11	54,942	98.38
76	02130908	S Branch Patapsco - 1996*	Patapsco	18	17	54,942	98.38
77	02131001	Magothy River	West Chesapeake	3	3	28,443	22.92
78	02131002	Severn River*	West Chesapeake	15	15	51,745	61.38
79	02131003	South River*	West Chesapeake	4	2	42,294	33.52
80	02131004	West River	West Chesapeake	3	2	19,865	15.86
81	02131005	West Chesapeake Bay*	West Chesapeake	10	10	52,919	84.83
82	02131101	Patuxent River Lower*	Patuxent	18	16	240,361	280.90
83	02131102	Patuxent River Middle*	Patuxent	7	7	67,904	111.19
84	02131103	Western Branch*	Patuxent	11	11	59,544	89.85
85	02131104	Patuxent River Upper*	Patuxent	5	5	56,446	94.92
86	02131105	Little Patuxent River*	Patuxent	14	14	66,215	122.48
87	02131106	Middle Patuxent River*	Patuxent	5	5	37,073	60.34
88	02131107	Rocky Gorge Dam*	Patuxent	6	6	34209	55.38

Table 2-1. (Continued)

Map Number	Watershed Code	Watershed Name	Basin	Number of Spring Sites	Number of Summer Sites	Watershed Area (acres)	Number of Non-Tidal Stream Miles
89	02131108	Brighton Dam*	Patuxent	16	16	50,594	96.14
90	02139996	Upper Chesapeake Bay		0	0	62,156	0.00
91	02139997	Middle Chesapeake Bay		0	0	97,902	0.00
92	02139998	Lower Chesapeake Bay		0	0	535,487	0.00
93	02140101	Potomac River L tidal	Lower Potomac	0	0	248,751	41.56
94	02140102	Potomac River M tidal	Lower Potomac	3	3	47,764	29.77
95	02140103	St. Mary's River	Lower Potomac	2	2	54,640	57.34
96	02140104	Breton Bay	Lower Potomac	2	2	38,447	53.44
97	02140105	St. Clement Bay*	Lower Potomac	7	7	33,258	43.42
98	02140106	Wicomico River	Lower Potomac	2	1	61,010	59.19
99	02140107	Gilbert Swamp	Lower Potomac	4	4	27,757	51.11
100	02140108	Zekiah Swamp*	Lower Potomac	19	17	69,902	120.75
101	02140109	Port Tobacco River	Lower Potomac	1	1	30,100	35.26
102	02140110	Nanjemoy Creek*	Lower Potomac	8	8	49,326	63.42
103	02140111	Mattawoman Creek*	Lower Potomac	6	5	62,190	93.44
104	02140201	Potomac River U tidal*	Potomac Washington Metro	4	4	36,252	31.77
105	02140202	Potomac River MO Cnty*	Potomac Washington Metro	12	12	88,226	160.68
106	02140203	Piscataway Creek*	Potomac Washington Metro	5	4	44,477	64.67
107	02140204	Oxon Creek	Potomac Washington Metro	0	0	6,869	10.09
108	02140205	Anacostia River*	Potomac Washington Metro	18	18	92,752	159.34
109	02140206	Rock Creek*	Potomac Washington Metro	9	9	39,262	53.49
110	02140207	Cabin John Creek*	Potomac Washington Metro	5	5	16,423	28.48
111	02140208	Seneca Creek*	Potomac Washington Metro	18	18	82,738	178.85
112	02140301	Potomac River FR Cnty*	Middle Potomac	8	7	43,101	65.64
113	02140302	Lower Monocacy River*	Middle Potomac	33	33	194,686	388.39

Table 2-1. (Continued)

Map Number	Watershed Code	Watershed Name	Basin	Number of Spring Sites	Number of Summer Sites	Watershed Area (acres)	Number of Non-Tidal Stream Miles
114	02140303	Upper Monocacy River*	Middle Potomac	36	36	156,500	284.38
115	02140304	Double Pipe Creek*	Middle Potomac	28	28	123,396	231.16
116	02140305	Catoctin Creek*	Middle Potomac	4	3	77,064	128.95
117	02140501	Potomac River WA Cnty*	Upper Potomac	5	4	58,297	73.06
118	02140502	Antietam Creek*	Upper Potomac	15	15	118,770	146.34
119	02140503	Marsh Run	Upper Potomac	2	2	13,459	23.00
120	02140504	Conococheague*	Upper Potomac	4	4	41,736	72.37
121	02140505	Little Conococheague	Upper Potomac	3	3	10,720	25.81
122	02140506	Licking Creek	Upper Potomac	1	1	17,719	32.93
123	02140507	Tonoloway Creek	Upper Potomac	0	0	1,338	0.99
124	02140508	Potomac River AL Cnty	Upper Potomac	3	3	32,552	65.53
125	02140509	Little Tonoloway Creek	Upper Potomac	3	3	9,885	21.38
126	02140510	Sideling Hill Creek*	Upper Potomac	6	6	14,138	21.08
127	02140511	Fifteen Mile Creek*	Upper Potomac	20	17	33,171	89.24
128	02140512	Town Creek*	Upper Potomac	7	7	43,410	91.48
129	02141001	Potomac River Lower North Branch*	North Branch Potomac	18	14	73,146	161.45
130	02141002	Evitts Creek	North Branch Potomac	3	2	19,955	50.11
131	02141003	Wills Creek*	North Branch Potomac	6	6	38,434	69.39
132	02141004	Georges Creek*	North Branch Potomac	7	7	47,695	82.56
133	02141005	Potomac River U N Branch*	North Branch Potomac	9	9	67,622	99.66
134	02141006	Savage River*	North Branch Potomac	19	19	74,538	127.13
135	05020201	Youghiogheny River - 1995*	Youghiogheny	23	19	154257	222.56
135	05020201	Youghiogheny River - 1997*	Youghiogheny	25	25	154,257	222.56
136	05020202	Little Youghiogheny River - 1995	Youghiogheny	3	3	13,113	24.62
136	05020202	Little Youghiogheny River - 1997	Youghiogheny	3	2	13,113	24.62

Table 2-1. (Continued)

Map Number	Watershed Code	Watershed Name	Basin	Number of Spring Sites	Number of Summer Sites	Watershed Area (acres)	Number of Non-Tidal Stream Miles
137	05020203	Deep Creek Lake - 1995*	Youghiogheny	4	4	40,938	37.81
137	05020203	Deep Creek Lake - 1997	Youghiogheny	3	3	40,938	37.81
138	05020204	Casselman River - 1995*	Youghiogheny	11	11	58,586	78.85
138	05020204	Casselman River - 1997*	Youghiogheny	13	13	58,586	78.85

3. IMPACTS OF ANTHROPOGENIC STRESSORS ON STREAM WATER QUALITY

Previous MBSS reports (Roth et al. 1999a, Roth et al. 1999b) have identified a list of seven major anthropogenic stressors upon stream water quality. These stressors can be summarized as follows:

- Urban Land Use - defined as a stressor on stream quality when present in greater than 25% of the catchment draining to the site

- Agricultural Land Use - defined as a stressor on stream quality when present in greater than 75% of the draining to the site

- Nutrients (specifically nitrate-nitrogen) - defined as a stressor on stream quality when present in concentrations greater than 7.0 mg/l

- Physical Habitat Degradation - defined as a stressor on stream quality when the Physical Habitat Index at a site (PHI; Hall et al. 1999) was scored as 42 or less (on a scale from 0 to 100)

- Lack of Riparian Vegetation - defined as a stressor on stream quality when the width of the effective riparian buffer at a site was equal to zero

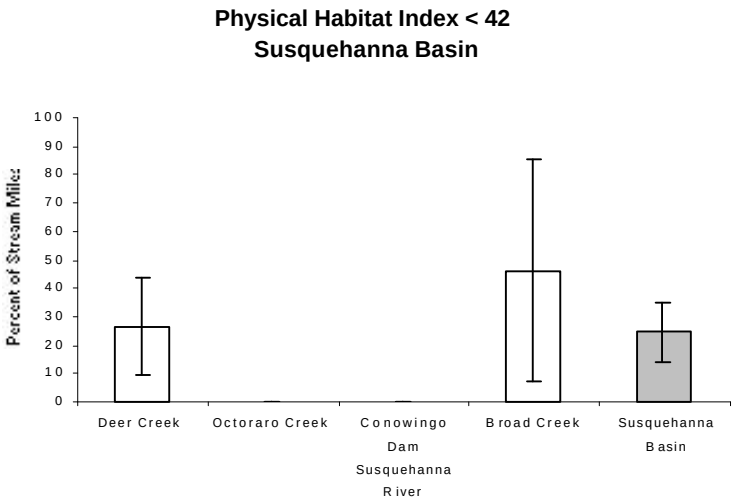
- Acidic Deposition - defined as a stressor on stream quality if the acid neutralizing capacity (ANC) at a site was less than 200 µeq/l and water chemistry did not indicate acidification from any other sources (Roth et al. 1999b)

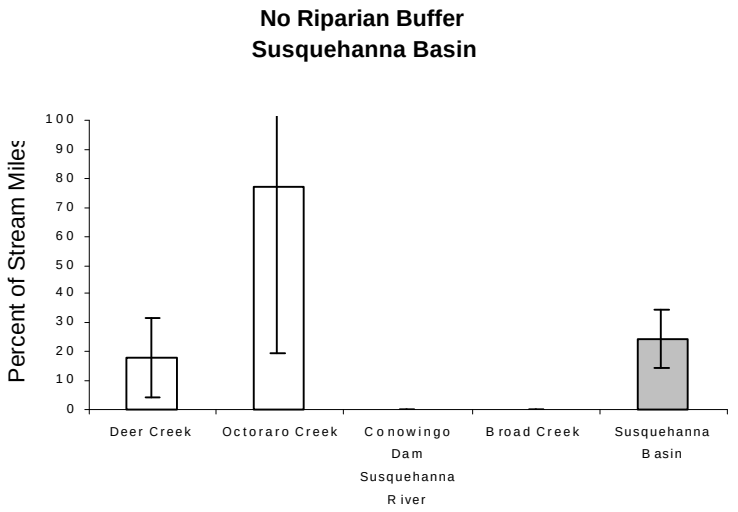
- Acid Mine Drainage (AMD) - defined as a stressor on stream quality if a site was located in the Youghiogheny or North Branch Potomac basin, had an ANC value less than 200 µeq/l, and had a sulfate concentration greater than 500 µeq/l (Roth et al. 1999b).

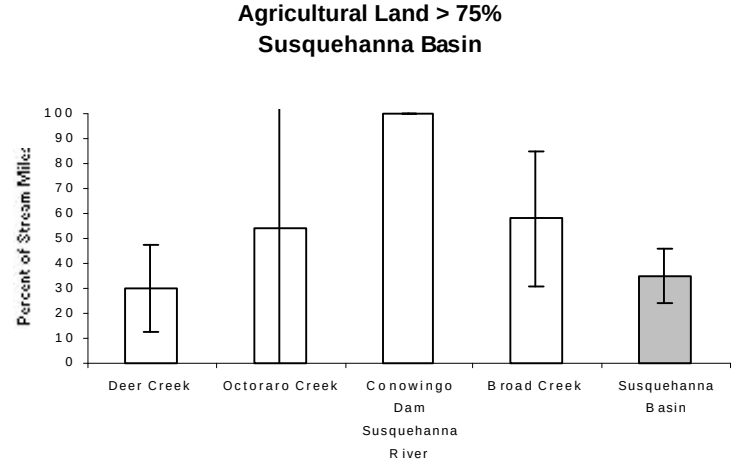
Figures 3-1 through 3-17 are organized by major drainage basin and present the extent of the seven stressors listed above (defined as the percentage of stream miles affected) in each Maryland 8-digit watershed. Accompanying each basin is a list of the watersheds contained in the basin and the number of spring and summer 1995-1997 MBSS sites located in those watersheds. Only the watersheds with four or more MBSS sites are included in the figures.

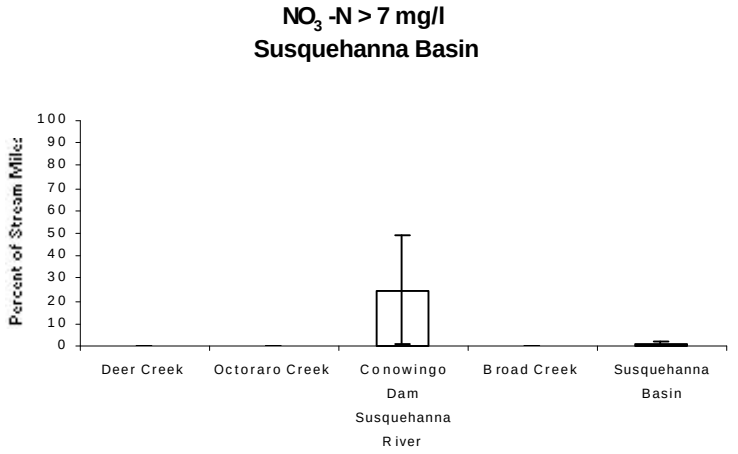
For example, the watersheds located in the Upper Potomac basin are illustrated in Figure 3-15. While this basin contains 11 small watersheds, only six watersheds are graphed. Stream mile estimates were not calculated for the remaining watersheds because they contained fewer than four MBSS sites. Six of the seven major anthropogenic stressors were present in the Upper Potomac basin; only AMD was absent. For each stressor, the figures illustrate the degree of impact (i.e., the

basin estimate) and its distribution within the basin (i.e., the watershed estimates). For instance, physical habitat degradation occurred at more than 50% of the stream miles in each of the six watersheds in the Upper Potomac basin, indicating that this stressor is widespread throughout the basin. The absence of a riparian buffer was also a stressor in each of the six watersheds shown, but it affected a substantially greater number of stream miles in Antietam Creek than in the remaining five watersheds. This result suggests that restoration work in the riparian buffer zone in the Upper Potomac basin should be focused on Antietam Creek. Additional field sampling or the use of aerial photography could be used to confirm the extent of riparian buffer problems in the remaining watersheds. Each stressor figure throughout the report should be interpreted in a similar fashion. The actual estimates, including the standard errors, of the extent of each of the seven stressors by watershed and major drainage basin can be found in Table A-1, Appendix A.



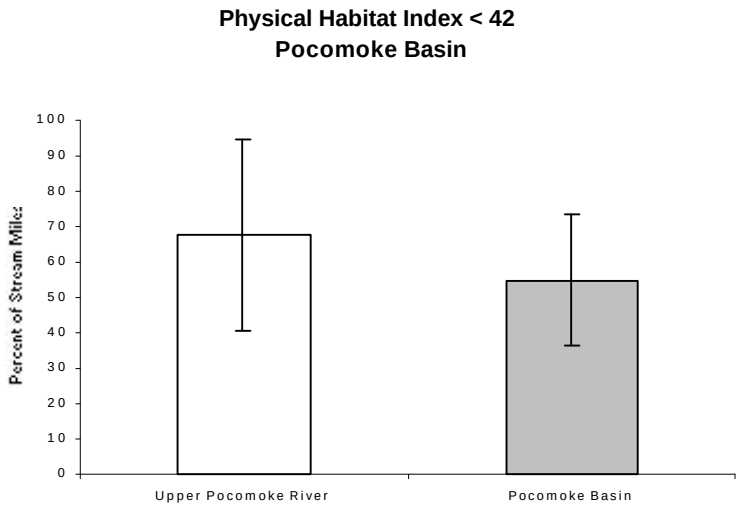


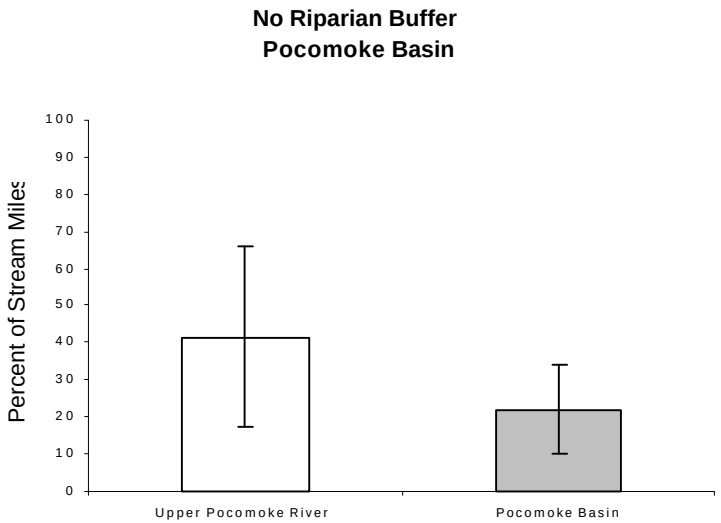


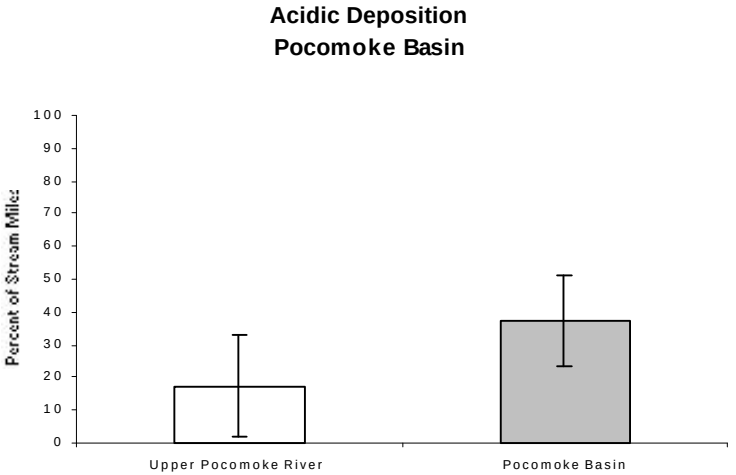


Susquehanna Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02120201	L Susquehanna River	3	3
02120202	Deer Creek	18	18
02120203	Octoraro Creek	5	5
02120204	Conowingo Dam Susquehanna R.	4	4
02120205	Broad Creek	7	5

Figure 3-1. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Susquehanna basin. Error bars signify ±1 standard error.

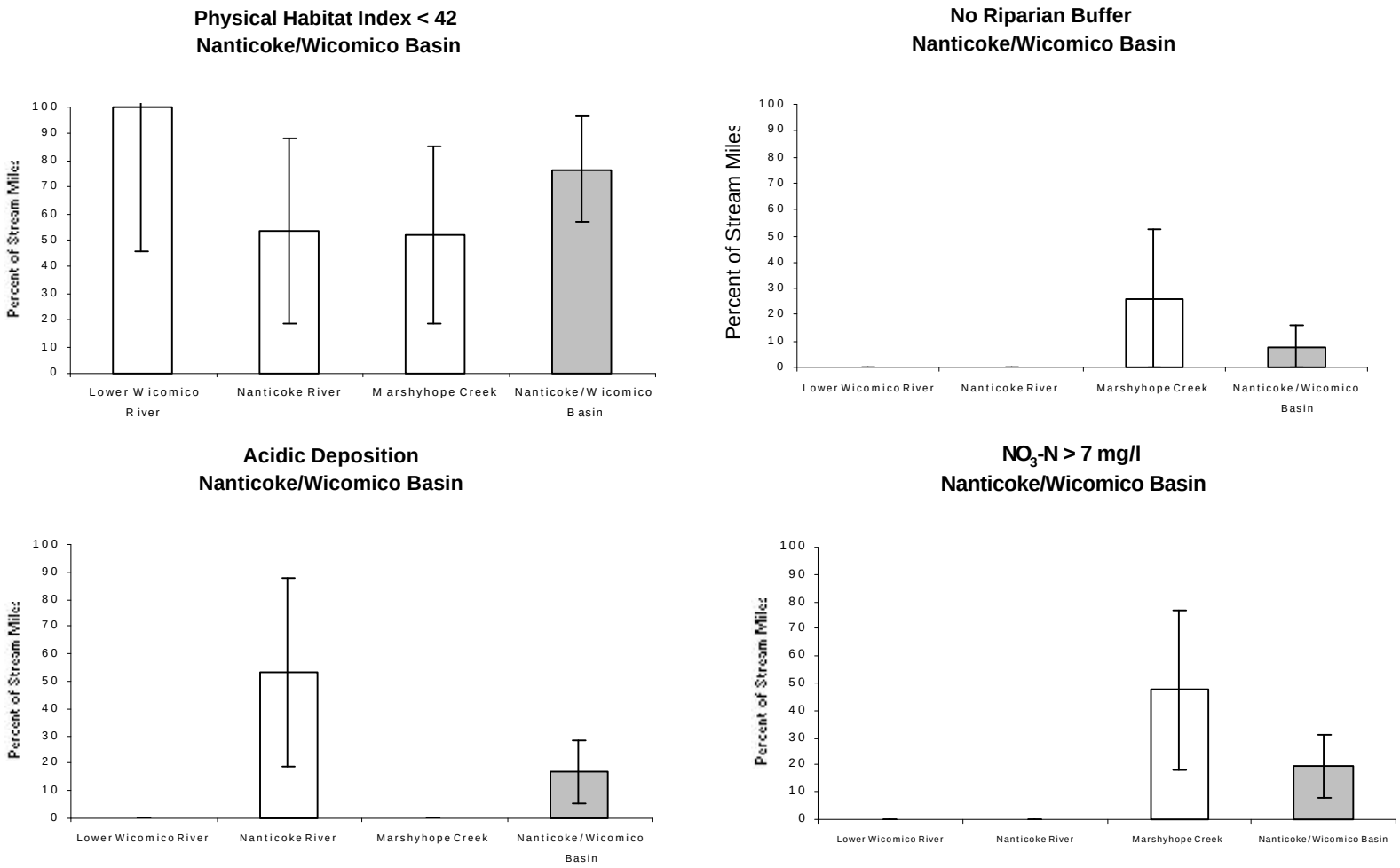






Pocomoke Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130201	Pocomoke Sound	2	1
02130202	Lower Pocomoke River	2	1
02130203	Upper Pocomoke River	24	22
02130204	Dividing Creek	0	0
02130205	Nassawango Creek	3	2
02130206	Tangier Sound	0	0
02130207	Big Annemessex River	0	0
02130208	Manokin River	2	2

Figure 3-2. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Pocomoke basin. Error bars signify ±1 standard error.



Nanticoke/Wicomico Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130301	Lower Wicomico River	4	3
02130302	Monie Bay	0	0
02130303	Wicomico Creek	1	1
02130304	Wicomico River Head	3	3
02130305	Nanticoke River	4	4
02130306	Marshyhope Creek	5	5
02130307	Fishing Bay	0	0
02130308	Transquaking River	1	1

Figure 3-3. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Nanticoke/Wicomico basin. Error bars signify ±1 standard error.

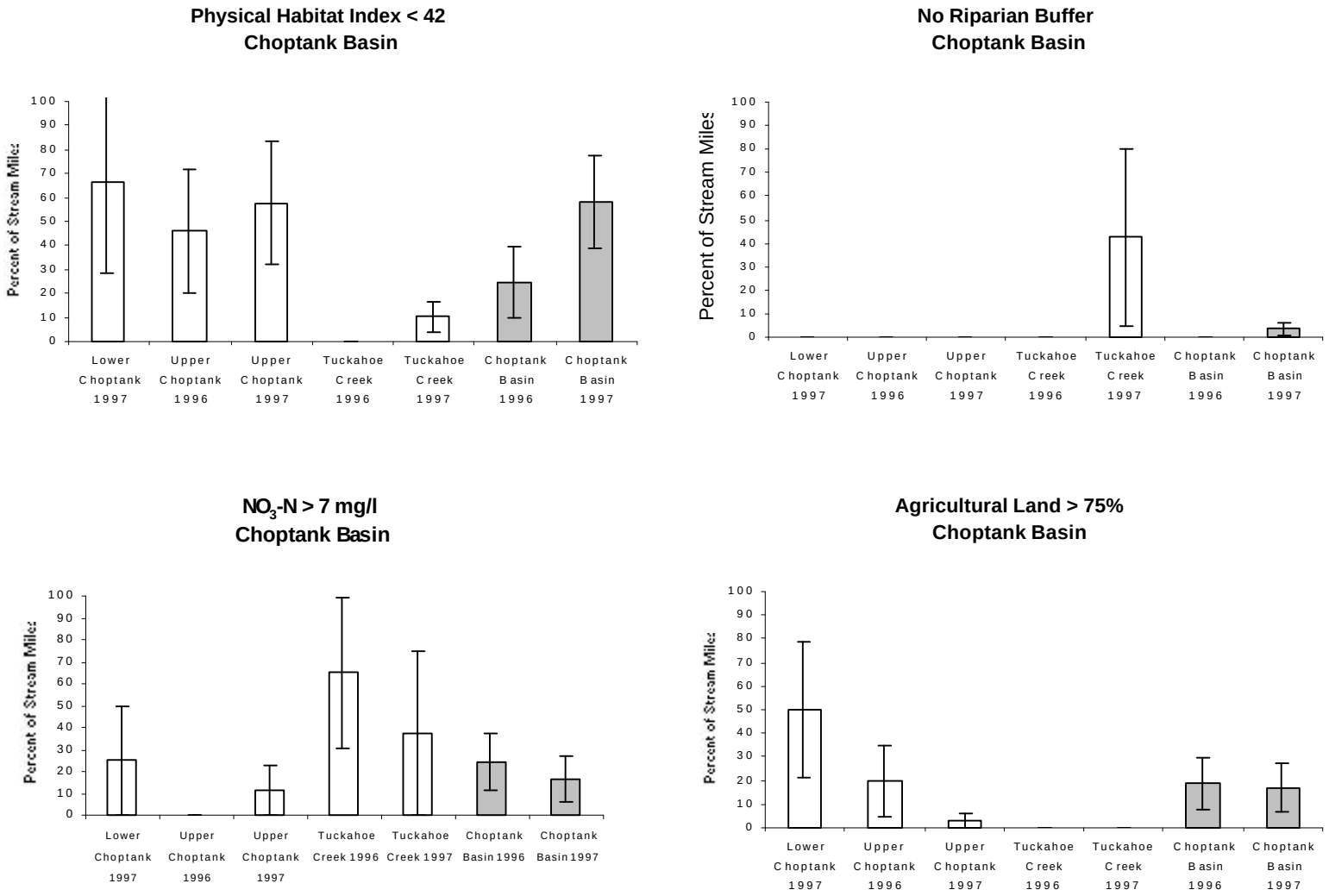
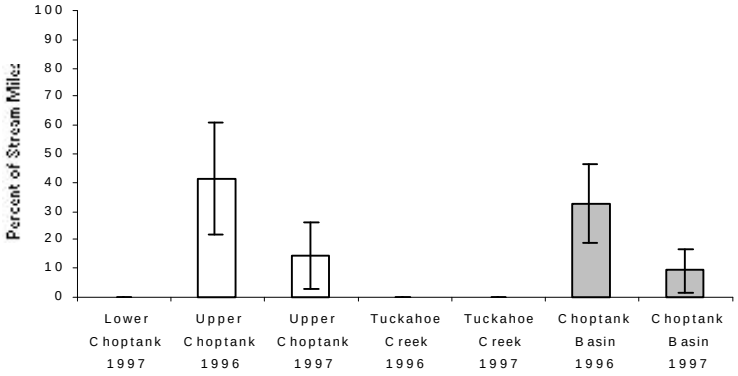


Figure 3-4. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Choptank basin, 1995 and 1996 sampling. Error bars signify ±1 standard error.

Acidic Deposition
Choptank Basin



Choptank Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130401	Honga River - 1996	0	0
02130401	Honga River - 1997	0	0
02130402	Little Choptank - 1996	0	0
02130402	Little Choptank - 1997	0	0
02130403	Lower Choptank - 1996	2	1
02130403	Lower Choptank - 1997	4	3
02130404	Upper Choptank - 1996	9	7
02130404	Upper Choptank - 1997	14	9
02130405	Tuckahoe Creek - 1996	10	10
02130405	Tuckahoe Creek - 1997	7	7

Figure 3-4. (Continued)

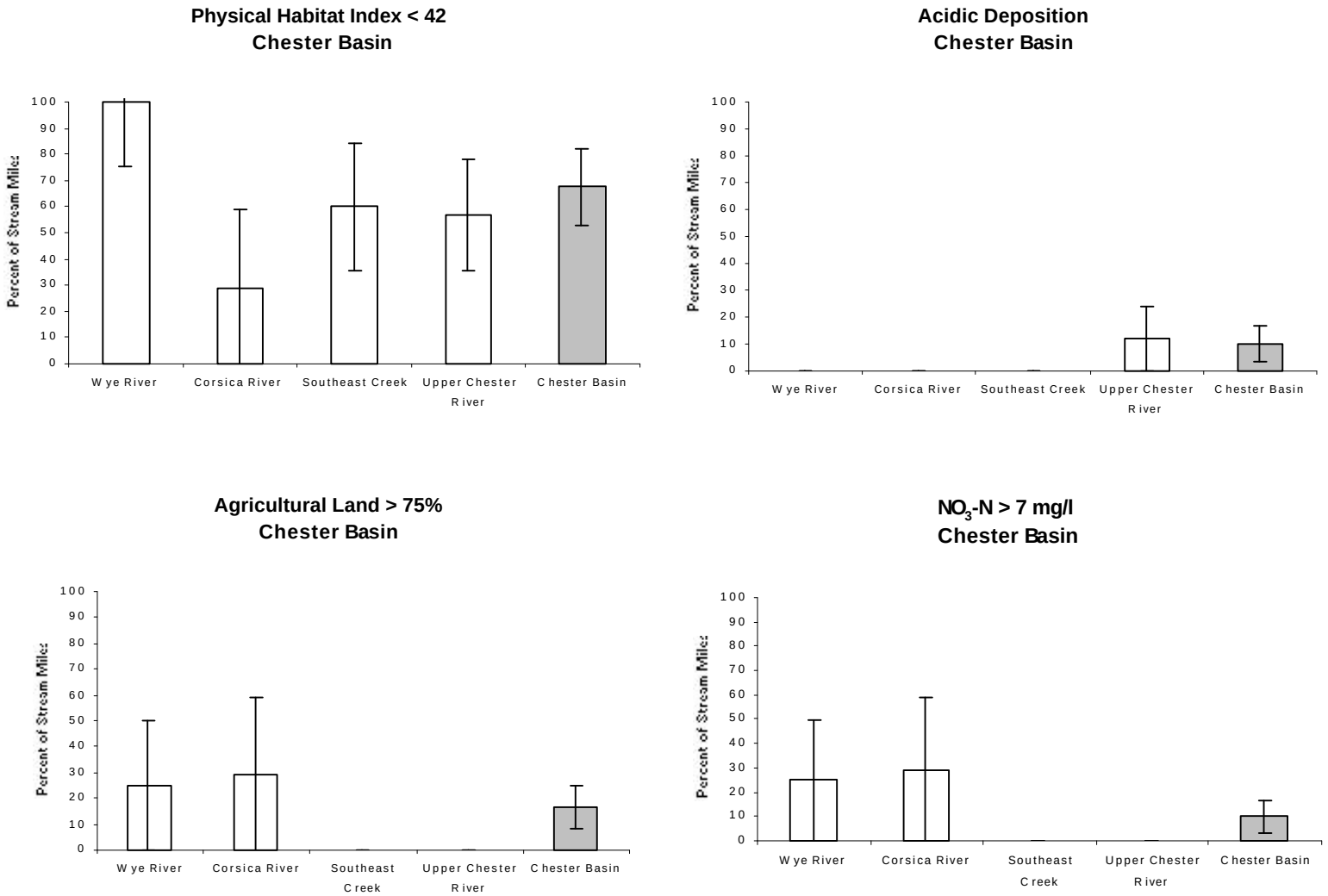
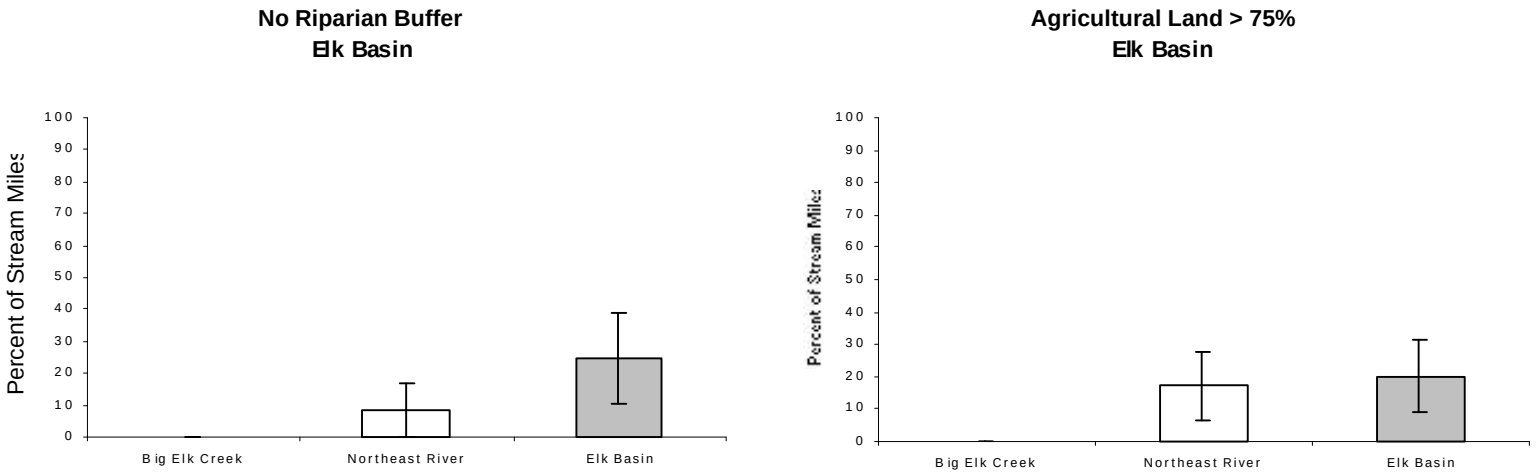


Figure 3-5. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Chester basin. Error bars signify ±1 standard error.

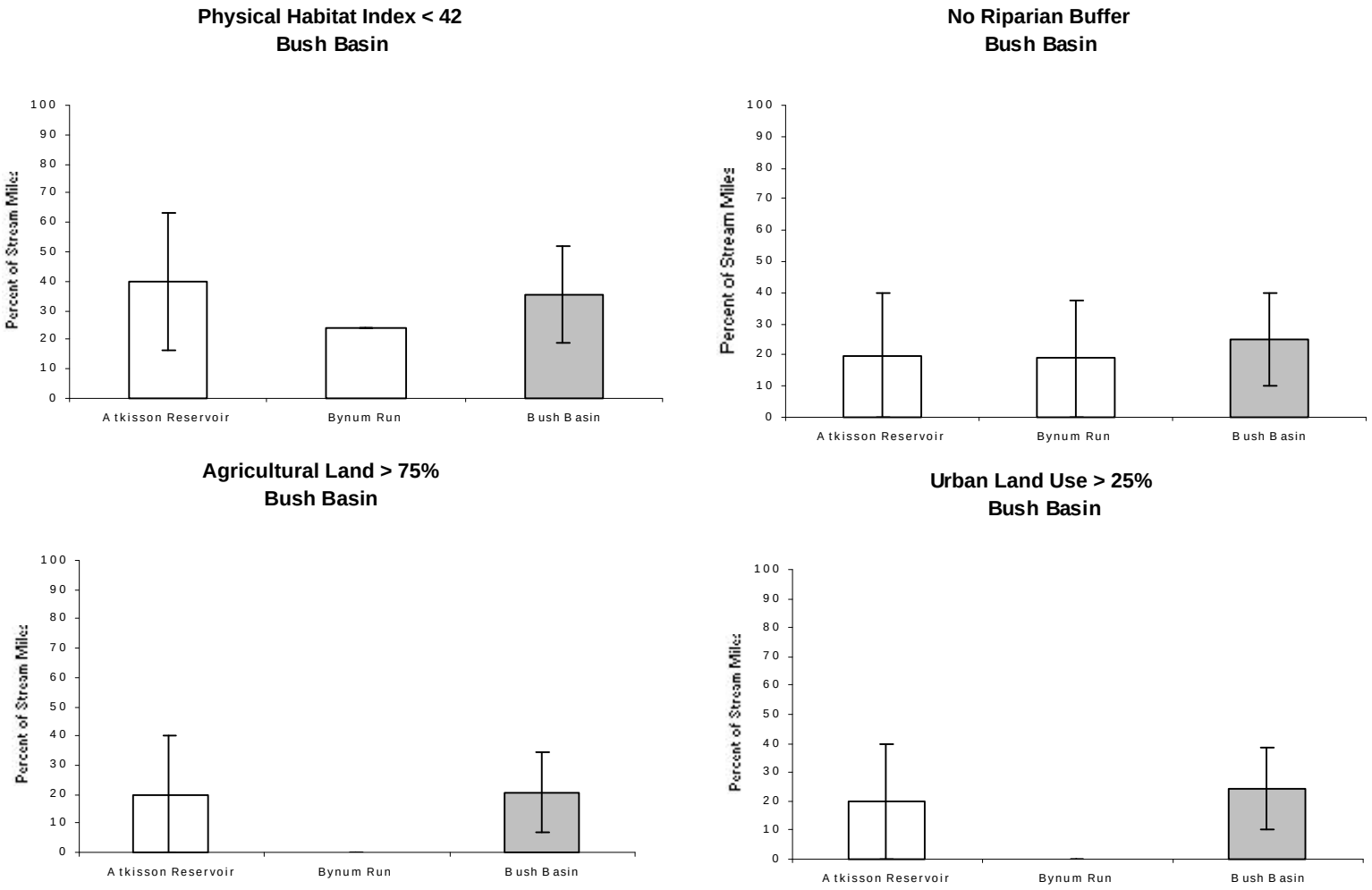
Chester River - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130501	Eastern Bay	0	0
02130502	Miles River	0	0
02130503	Wye River	4	4
02130504	Kent Narrows	0	0
02130505	Lower Chester River	2	2
02130506	Langford Creek	1	1
02130507	Corsica River	6	6
02130508	Southeast Creek	6	5
02130509	Middle Chester River	2	2
02130510	Upper Chester River	21	19
02130511	Kent Island Bay	0	0

Figure 3-5. (Continued)



Elk Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130601	Lower Elk River	0	0
02130602	Bohemia River	0	0
02130603	Upper Elk River	0	0
02130604	Back Creek	0	0
02130605	Little Elk Creek	3	3
02130606	Big Elk Creek	4	4
02130607	Christina River	1	1
02130608	Northeast River	6	6
02130609	Furnace Bay	3	3
02130610	Sassafras River	0	0
02130611	Stillpond-Fairlee	0	0

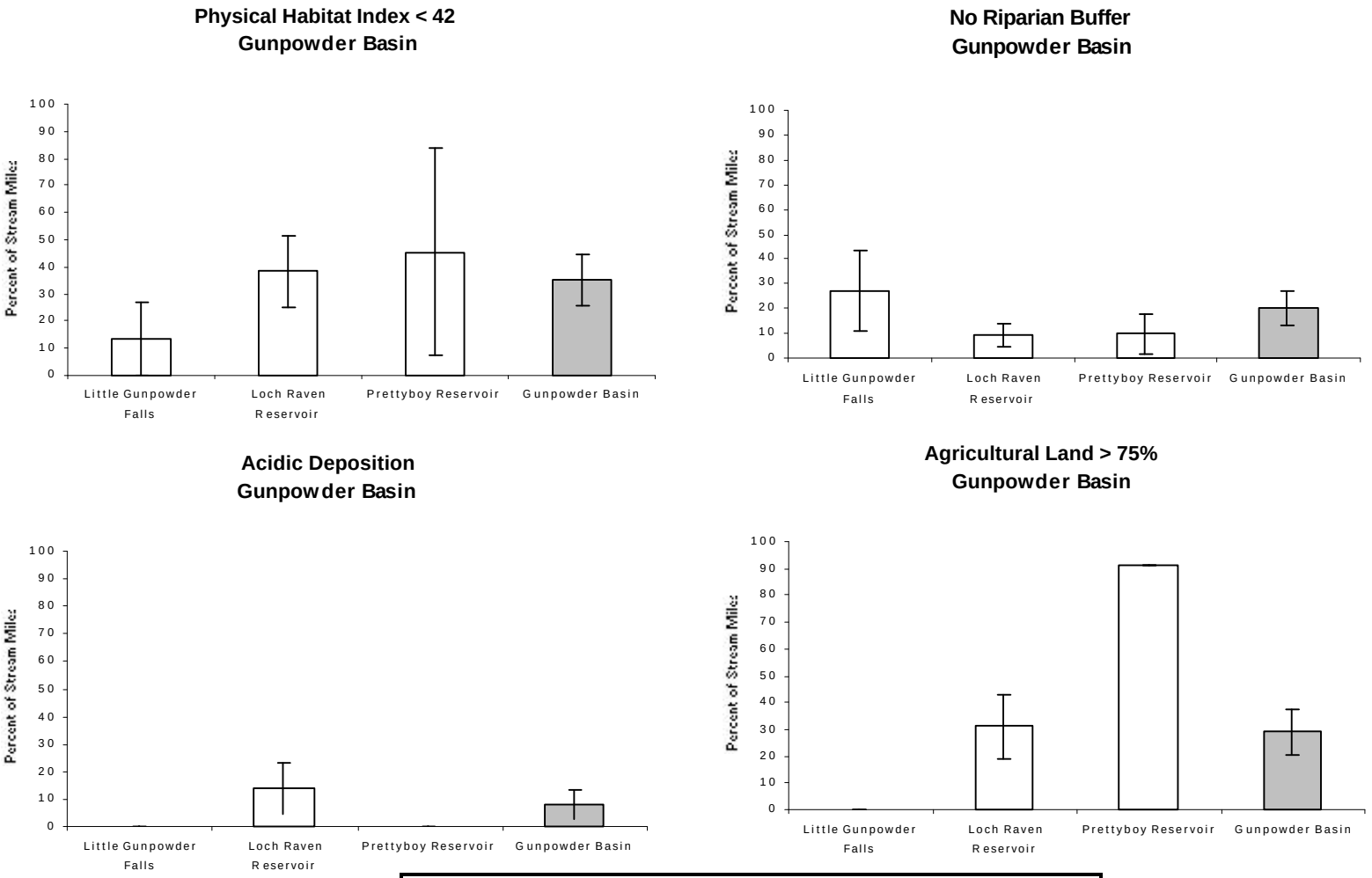
Figure 3-6. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Elk basin. Error bars signify ±1 standard error.



Bush Basin - 1995-1997 MBSS sampling

Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130701	Bush River	2	2
02130702	Lower Winters Run	3	3
02130703	Atkisson Reservoir	6	6
02130704	Bynum Run	5	5
02130705	Aberdeen Proving Ground	1	0
02130706	Swan Creek	3	3

Figure 3-7. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Bush basin. Error bars signify ±1 standard error.



Gunpowder Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130801	Gunpowder River	0	0
02130802	Lower Gunpowder Falls	3	3
02130803	Bird River	0	0
02130804	Little Gunpowder Falls	8	8
02130805	Loch Raven Reservoir	25	25
02130806	Prettyboy Reservoir	9	9
02130807	Middle River - Browns	0	0

Figure 3-8. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Gunpowder basin. Error bars signify ±1 standard error.

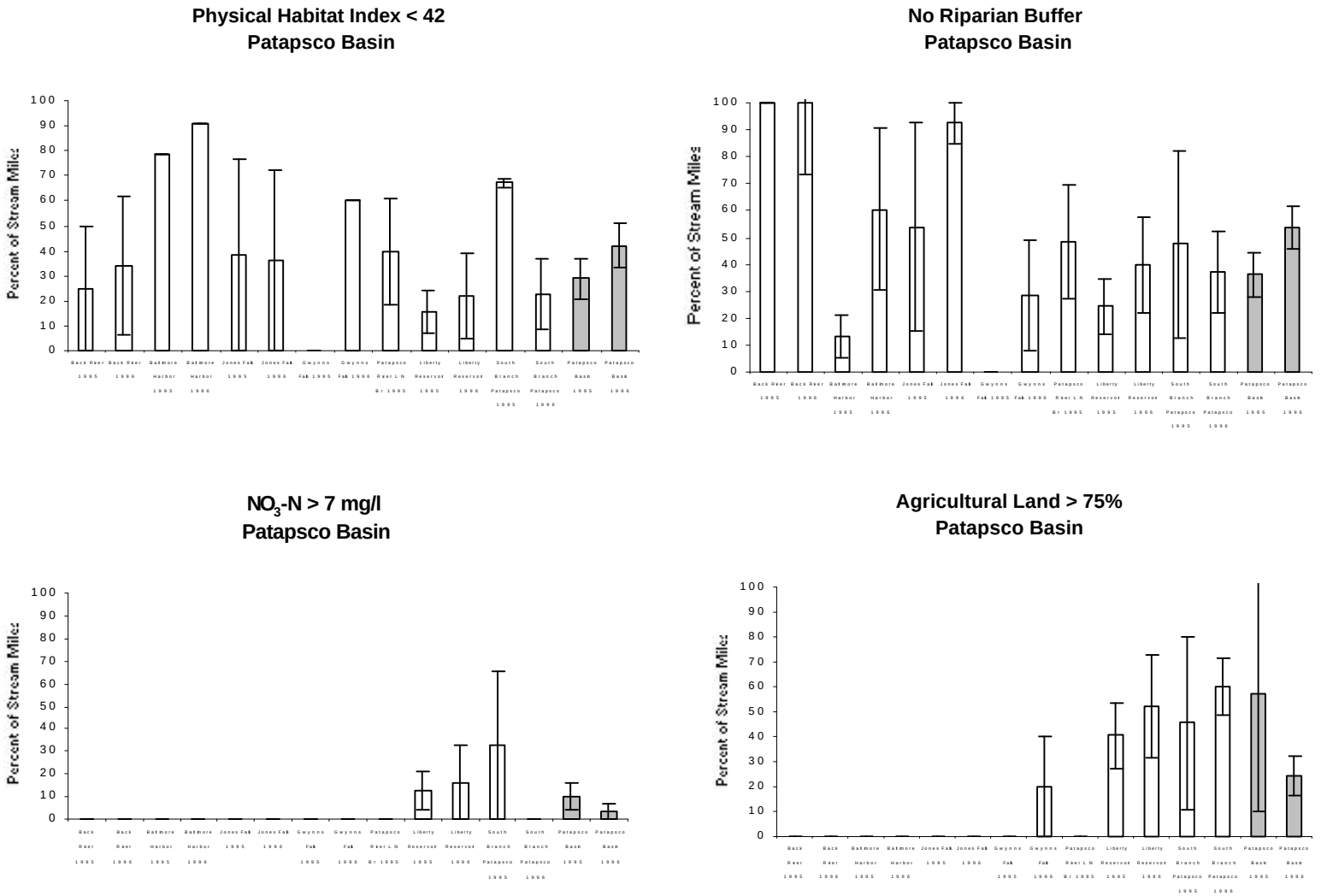
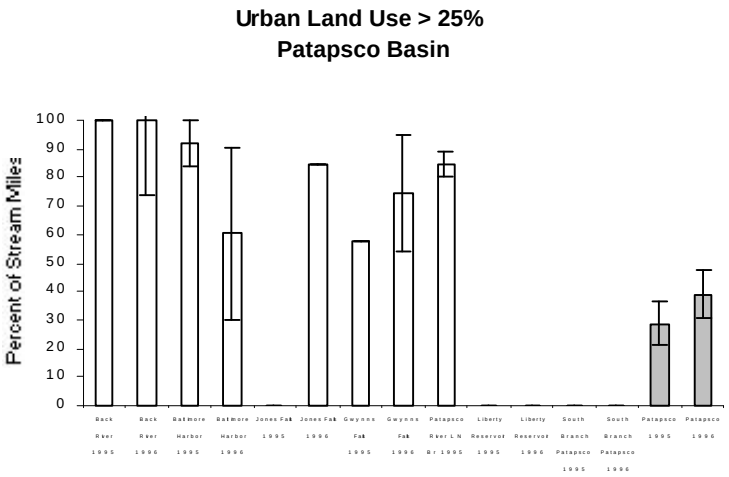
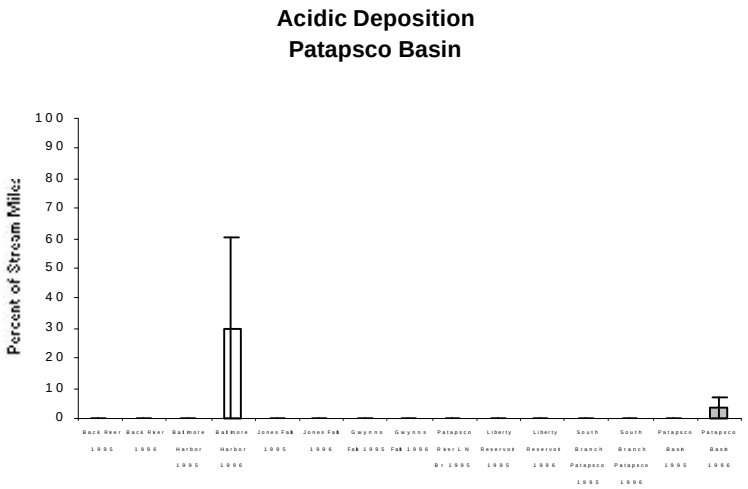


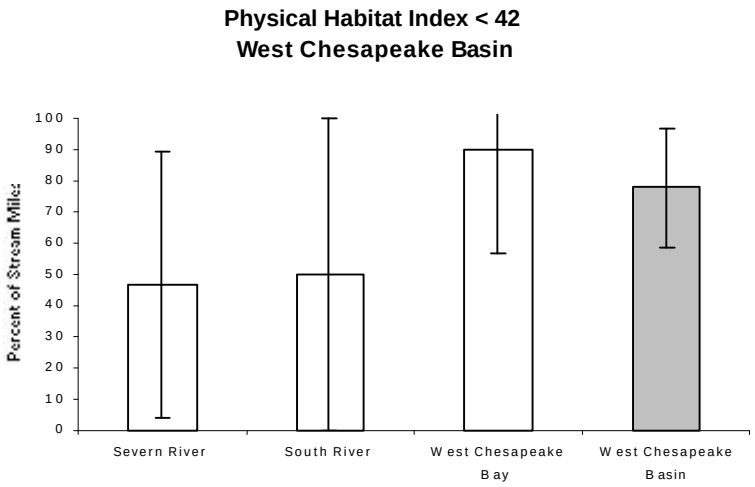
Figure 3-9. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Patapsco basin, 1995 and 1996 sampling. Error bars signify ±1 standard error.

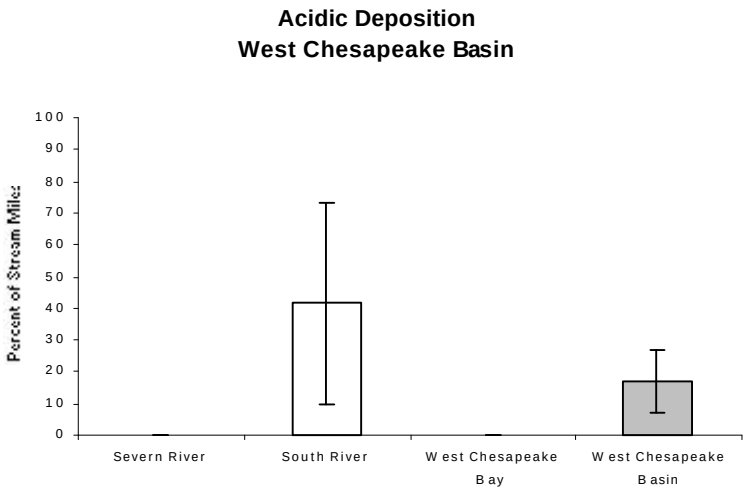


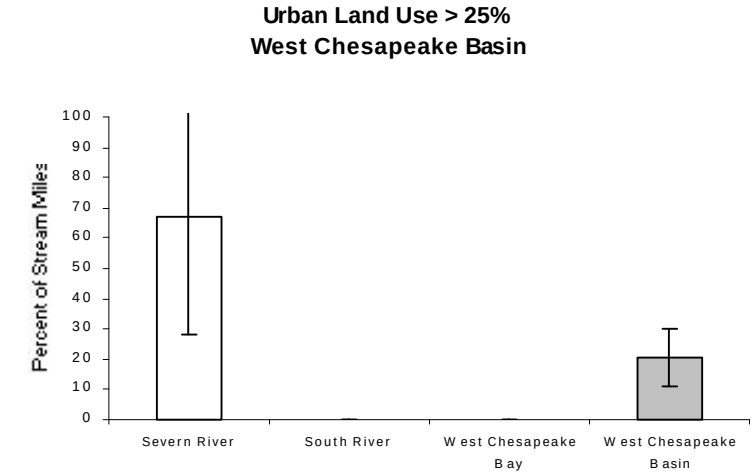


Patapsco Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130901	Back River - 1995	4	4
02130901	Back River - 1996	8	8
02130902	Bodkin Creek - 1995	0	0
02130902	Bodkin Creek - 1996	0	0
02130903	Baltimore Harbor - 1995	4	4
02130903	Baltimore Harbor - 1996	4	4
02130904	Jones Falls - 1995	5	5
02130904	Jones Falls - 1996	5	5
02130905	Gwynns Falls - 1995	4	4
02130905	Gwynns Falls - 1996	12	12
02130906	Patapsco River L N Br - 1995	14	14
02130906	Patapsco River L N Br - 1996	3	3
02130907	Liberty Reservoir - 1995	19	19
02130907	Liberty Reservoir - 1996	18	16
02130908	S Branch Patapsco - 1995	11	11
02130908	S Branch Patapsco - 1996	18	17

Figure 3-9. (continued)







West Chesapeake Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02131001	Magothy River	3	3
02131002	Severn River	15	15
02131003	South River	4	2
02131004	West River	3	2
02131005	West Chesapeake Bay	10	10

Figure 3-10. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the West Chesapeake basin, 1995 and 1996 sampling. Error bars signify ±1 standard error.

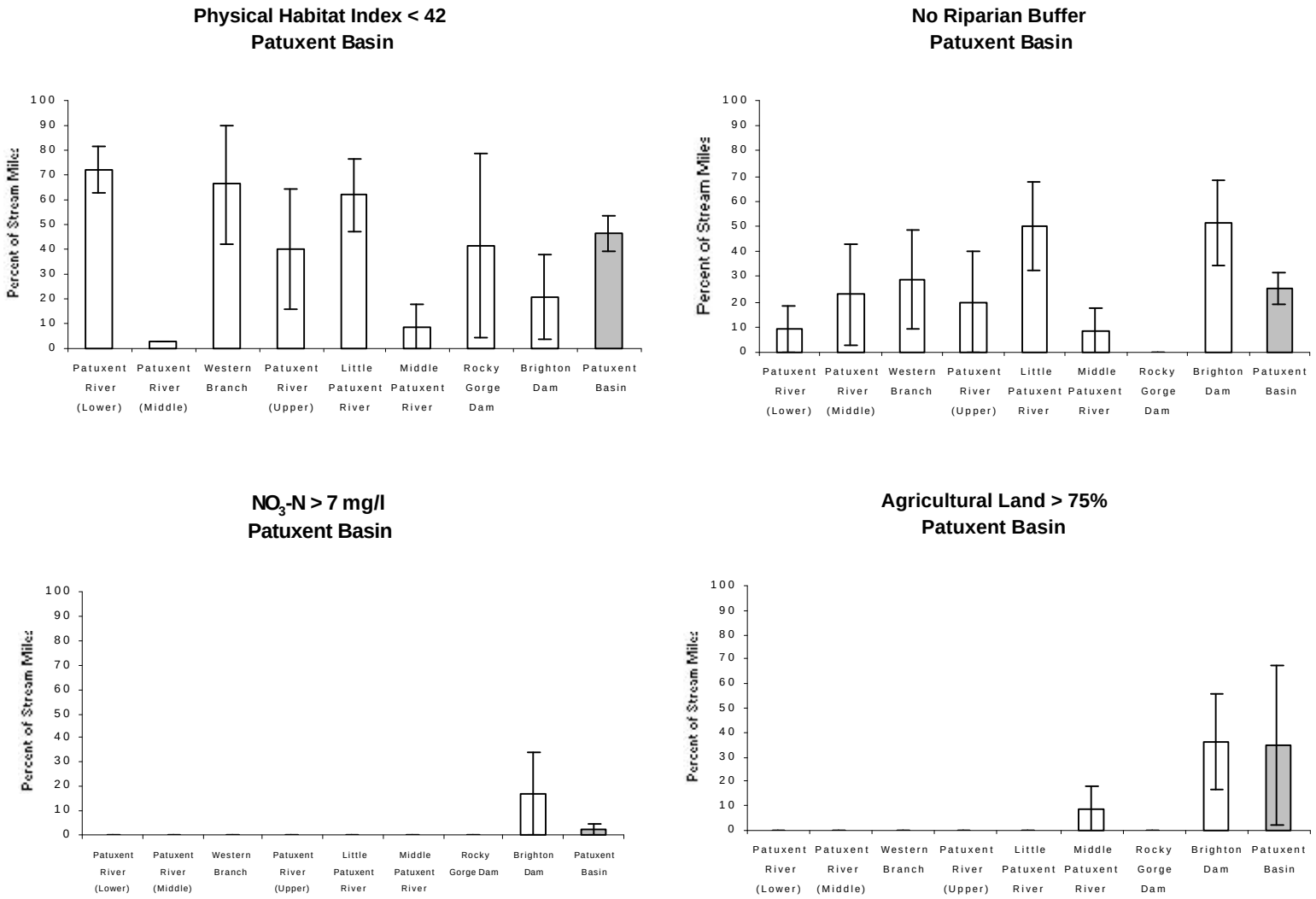
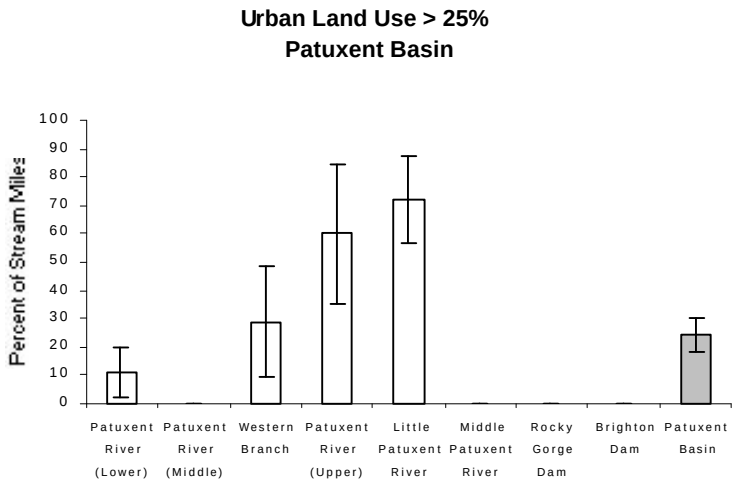
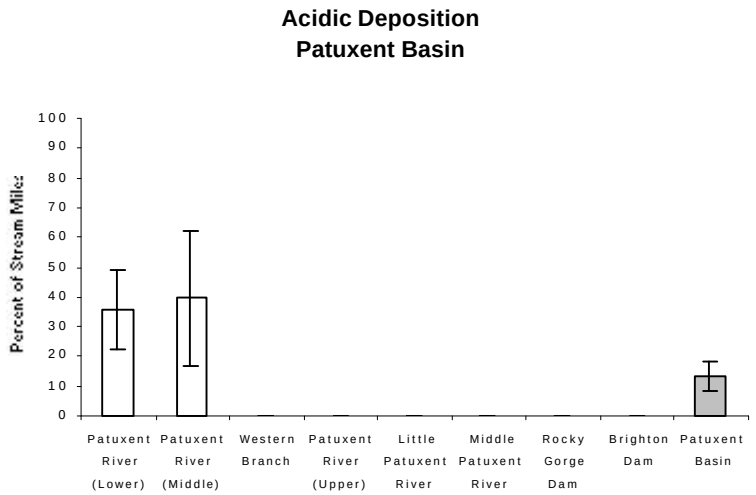


Figure 3-11. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Patuxent basin. Error bars signify ±1 standard error.





Patuxent Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02131101	Patuxent River Lower	18	16
02131102	Patuxent River Middle	7	7
02131103	Western Branch	11	11
02131104	Patuxent River Upper	5	5
02131105	Little Patuxent River	14	14
02131106	Middle Patuxent River	5	5
02131107	Rocky Gorge Dam	6	6
02131108	Brighton Dam	16	16

Figure 3-11. (Continued)

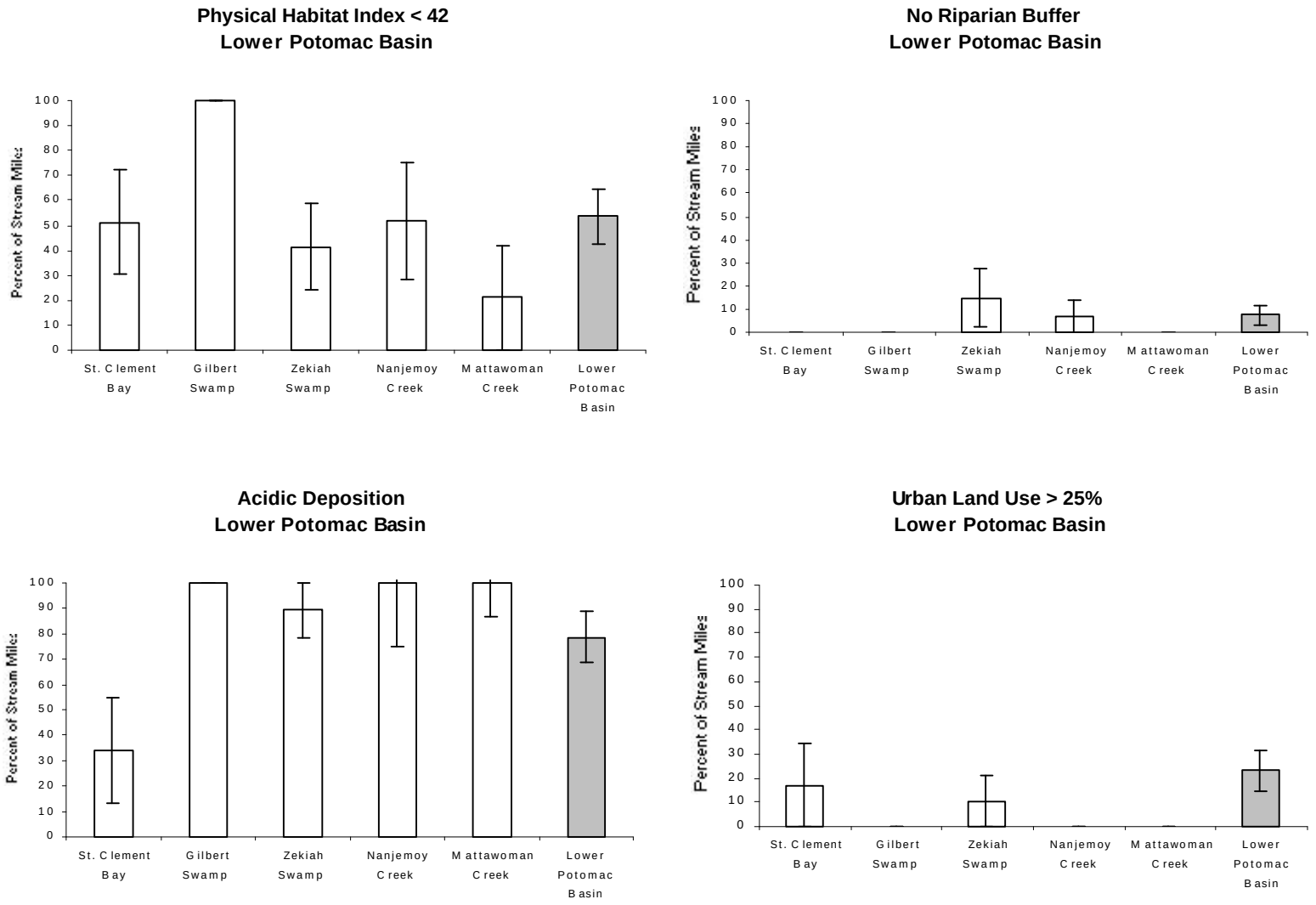


Figure 3-12. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Lower Potomac basin. Error bars signify ±1 standard error.

NO_3-N > 7 mg/l
Lower Potomac Basin

Lower Potomac Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140101	Potomac River L tidal	0	0
02140102	Potomac River M tidal	3	3
02140103	St. Mary's River	2	2
02140104	Breton Bay	2	2
02140105	St. Clement Bay	7	7
02140106	Wicomico River	2	1
02140107	Gilbert Swamp	4	4
02140108	Zekiah Swamp	19	17
02140109	Port Tobacco River	1	1
02140110	Nanjemoy Creek	8	8
02140111	Mattawoman Creek	6	5

Figure 3-12. (Continued)

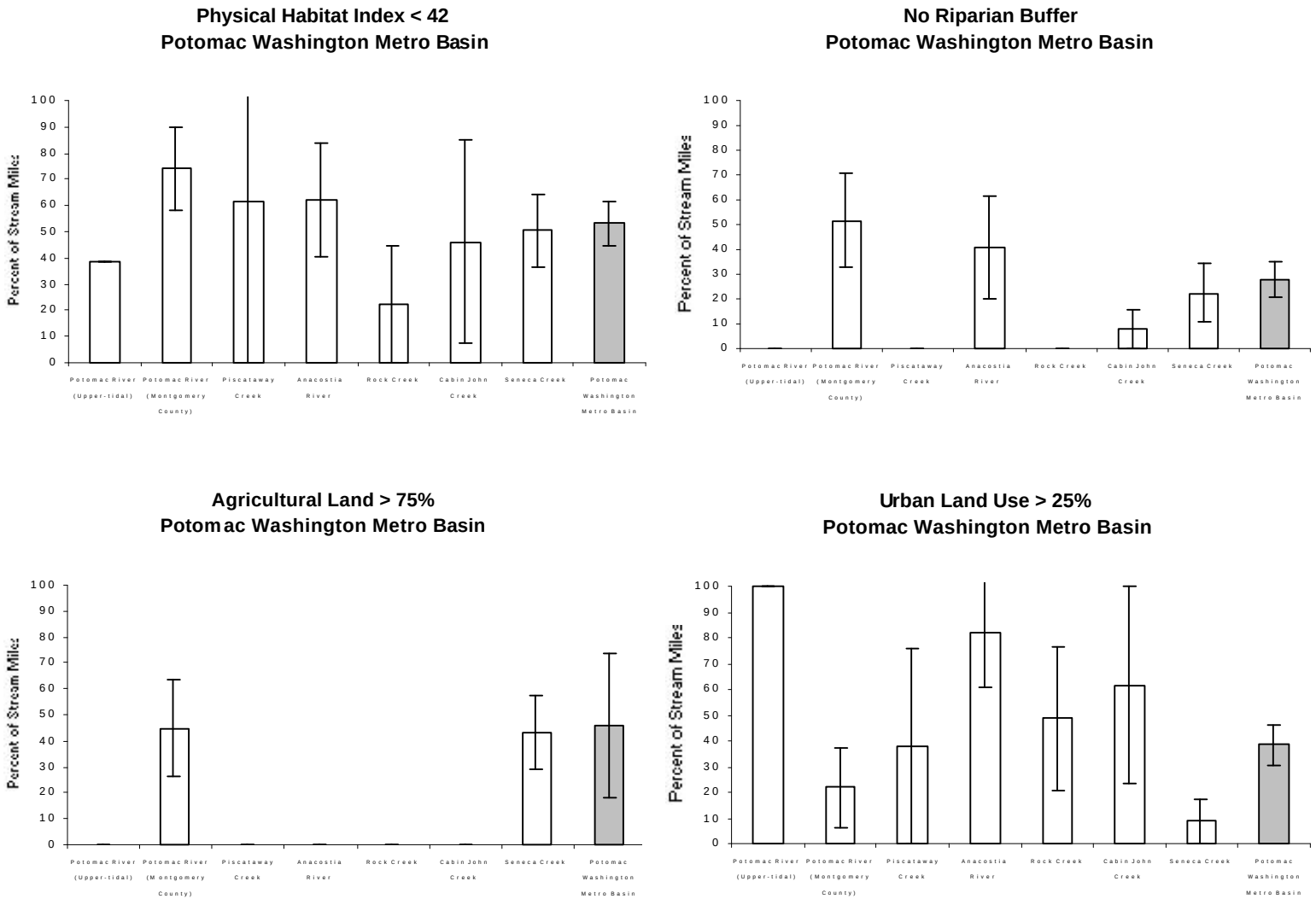
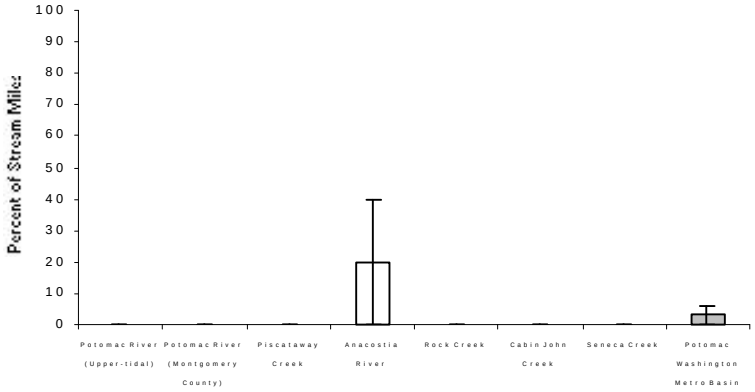


Figure 3-13. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Potomac Washington Metro basin. Error bars signify ±1 standard error.

Acidic Deposition
Potomac Washington Metro Basin



Potomac Washington Metro Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140201	Potomac River U tidal	4	4
02140202	Potomac River MO Cnty	12	12
02140203	Piscataway Creek	5	4
02140204	Oxon Creek	0	0
02140205	Anacostia River	18	18
02140206	Rock Creek	9	9
02140207	Cabin John Creek	5	5
02140208	Seneca Creek	18	18

Figure 3-13. (Continued)

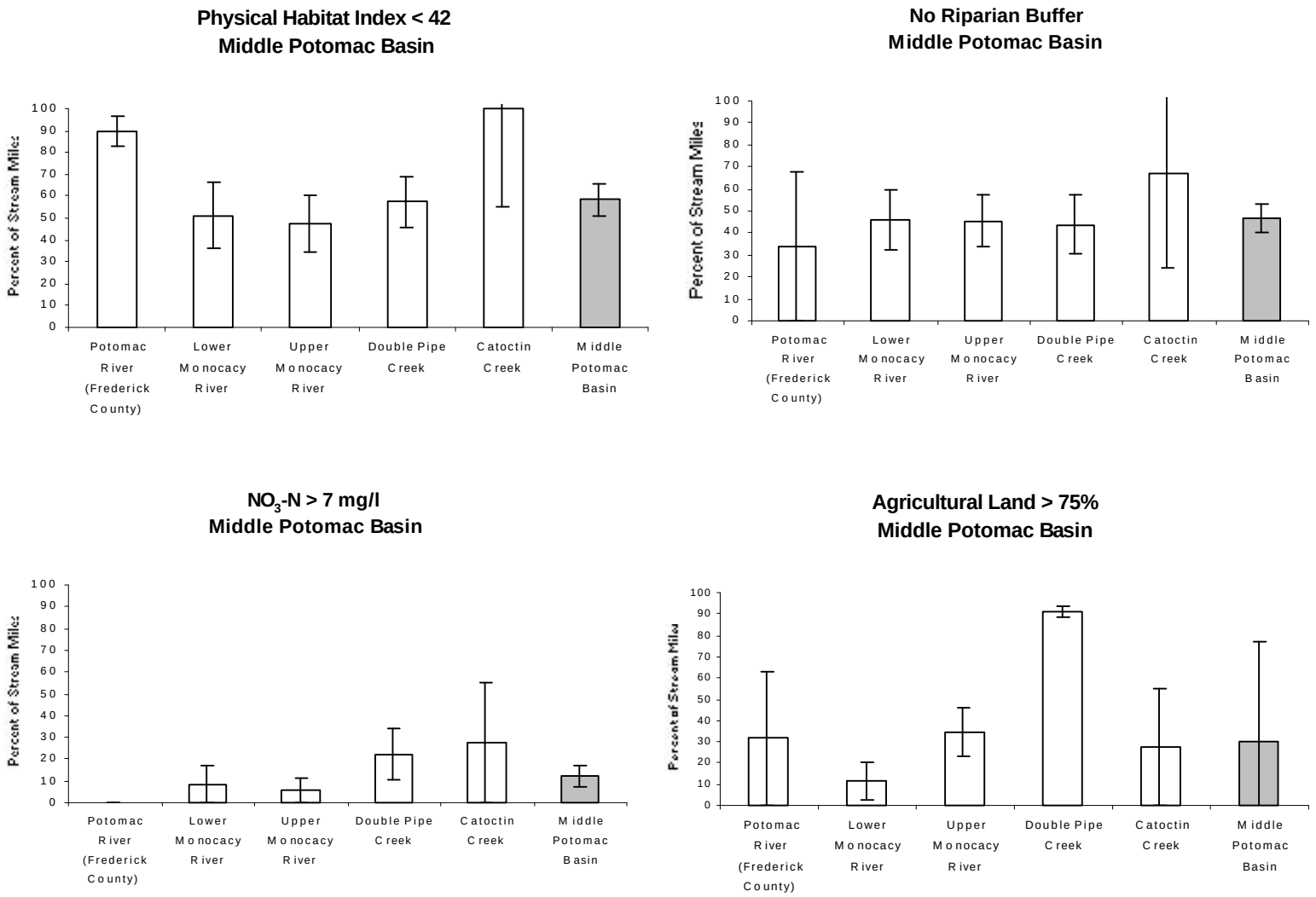
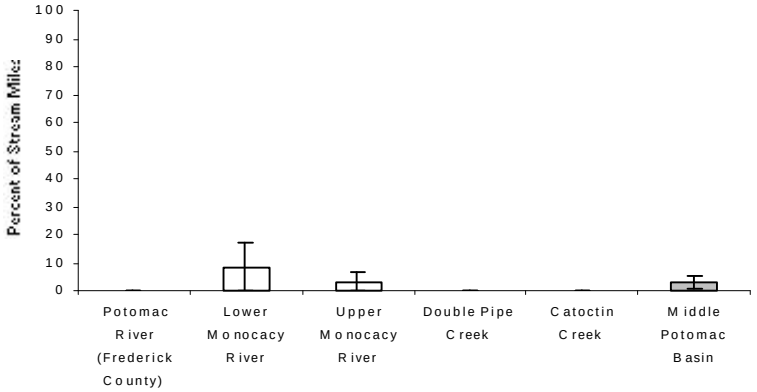


Figure 3-14. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Middle Potomac basin. Error bars signify ±1 standard error.

Acidic Deposition
Middle Potomac Basin



Middle Potomac Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140301	Potomac River FR Cnty	8	7
02140302	Lower Monocacy River	33	33
02140303	Upper Monocacy River	36	36
02140304	Double Pipe Creek	28	28
02140305	Catoctin Creek	4	3

Figure 3-14. (Continued)

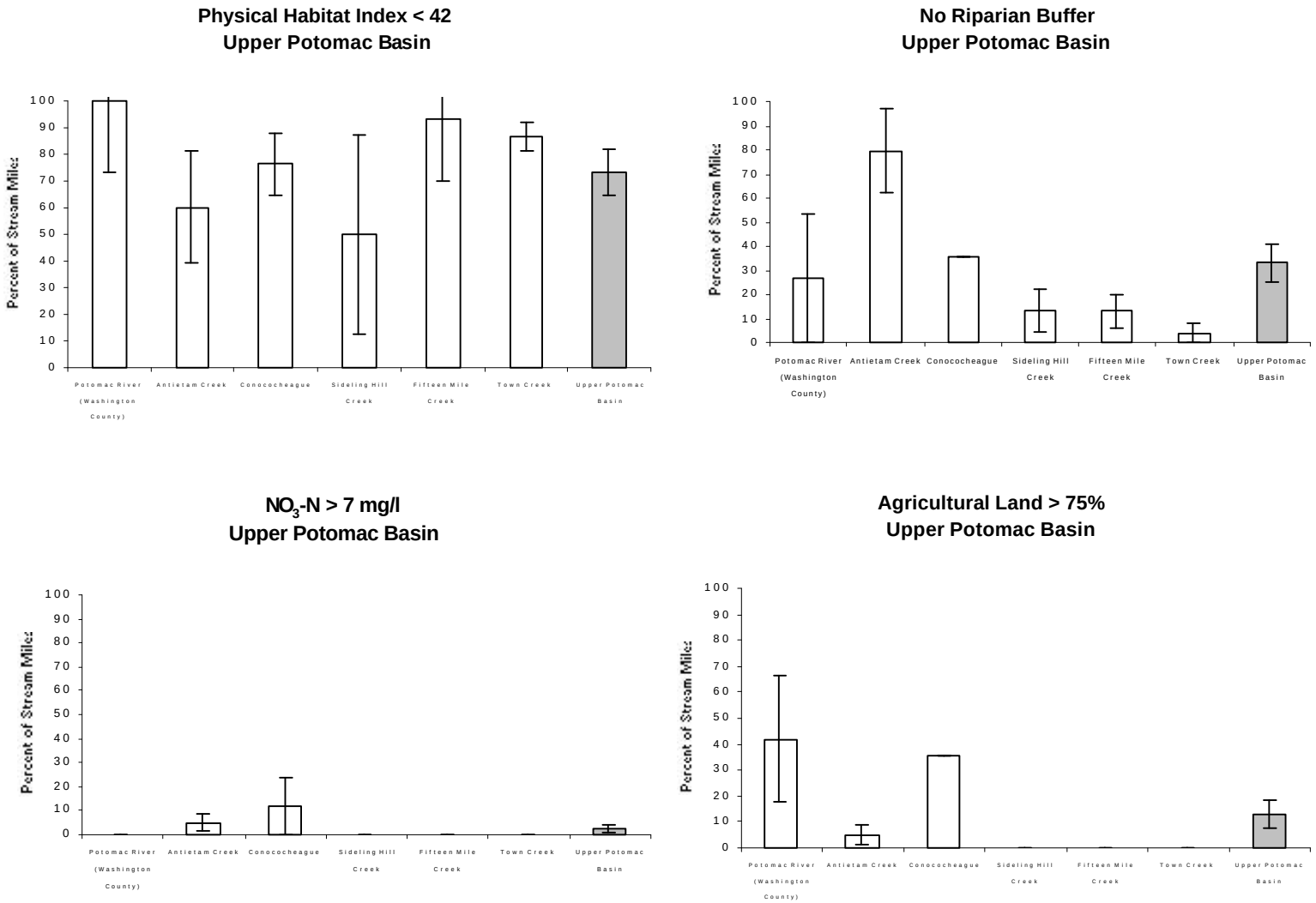
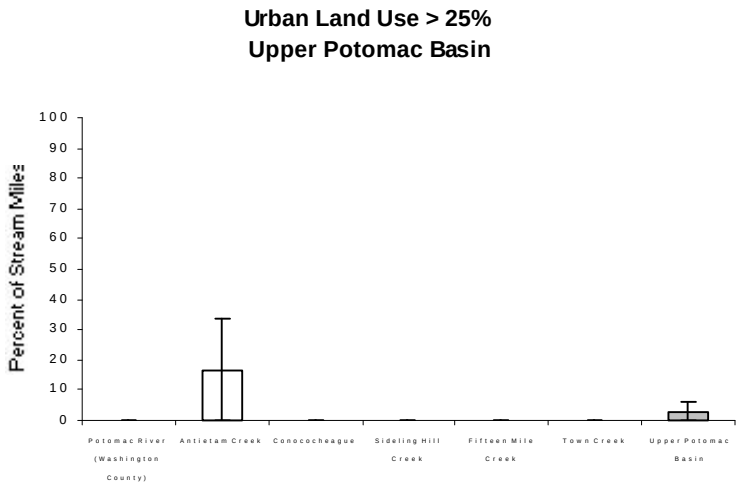
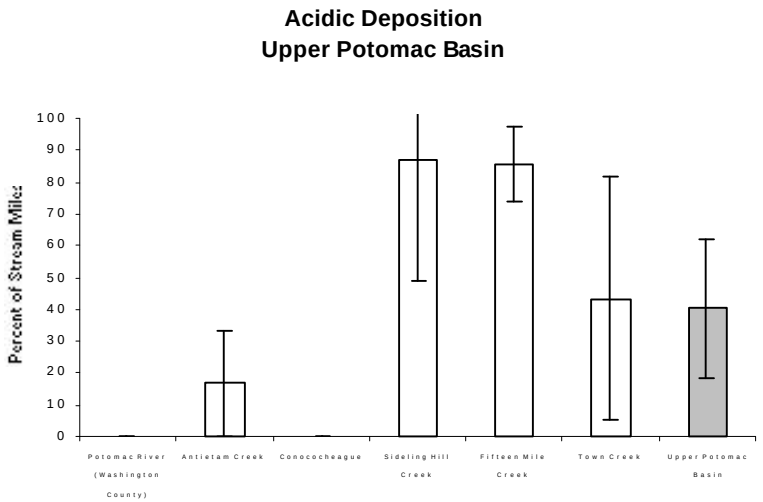


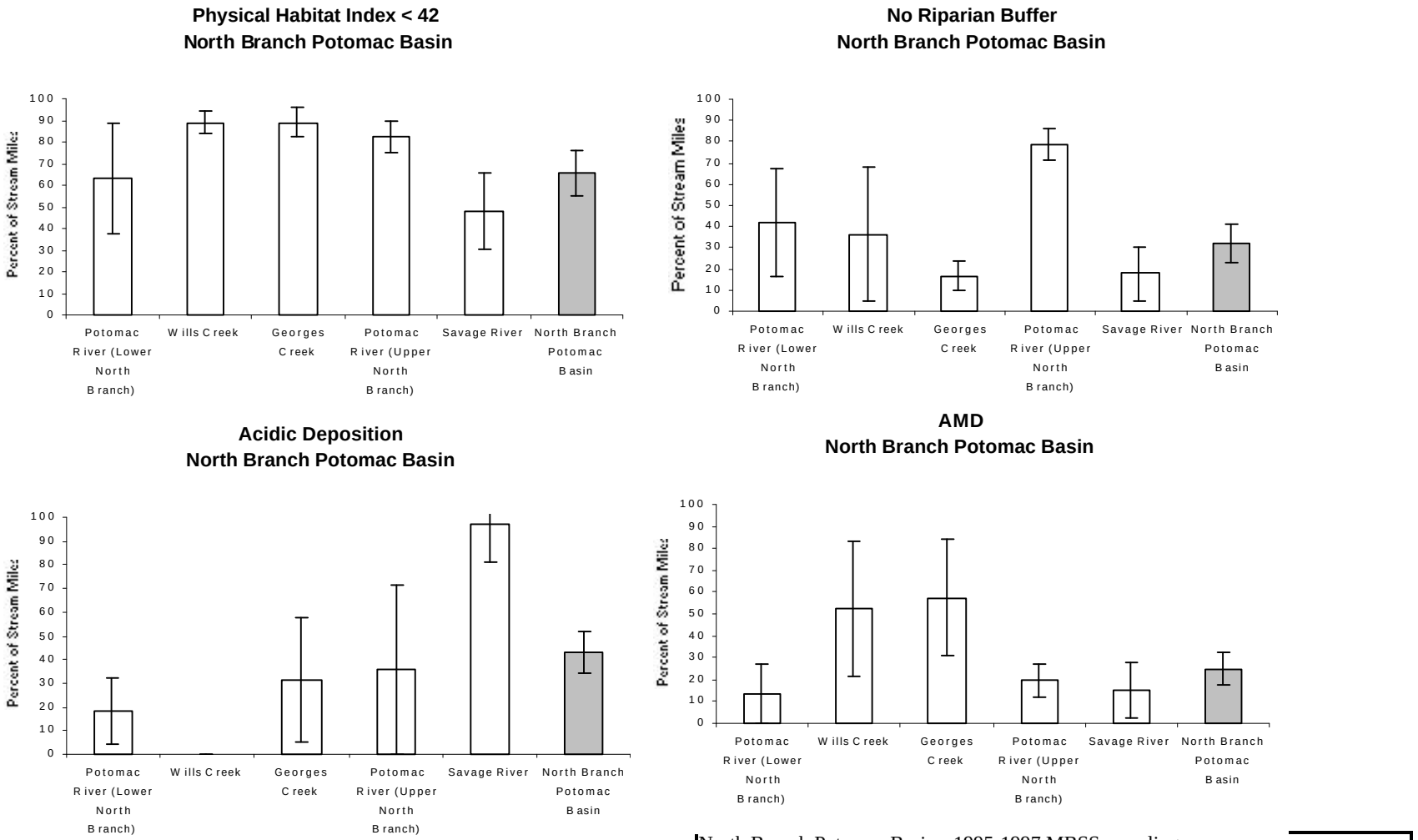
Figure 3-15. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Upper Potomac basin, 1996 and 1997 sampling. Error bars signify ±1 standard error.





Upper Potomac Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140501	Potomac River WA Cnty	5	4
02140502	Antietam Creek	15	15
02140503	Marsh Run	2	2
02140504	Conococheague	4	4
02140505	Little Concococheague	3	3
02140506	Licking Creek	1	1
02140507	Tonoloway Creek	0	0
02140508	Potomac River AL Cnty	3	3
02140509	Little Tonoloway Creek	3	3
02140510	Sideling Hill Creek	6	6
02140511	Fifteen Mile Creek	20	17

Figure 3-15. (Continued)



North Branch Potomac Basin - 1995-1997 MBSS sampling

Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02141001	Potomac River Lower North Branch	18	14
02141002	Evitts Creek	3	2
02141003	Wills Creek	6	6
02141004	Georges Creek	7	7
02141005	Potomac River U N Branch	9	9
02141006	Savage River	19	19

Figure 3-16. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the North Branch Potomac basin. Error bars signify ±1 standard error.

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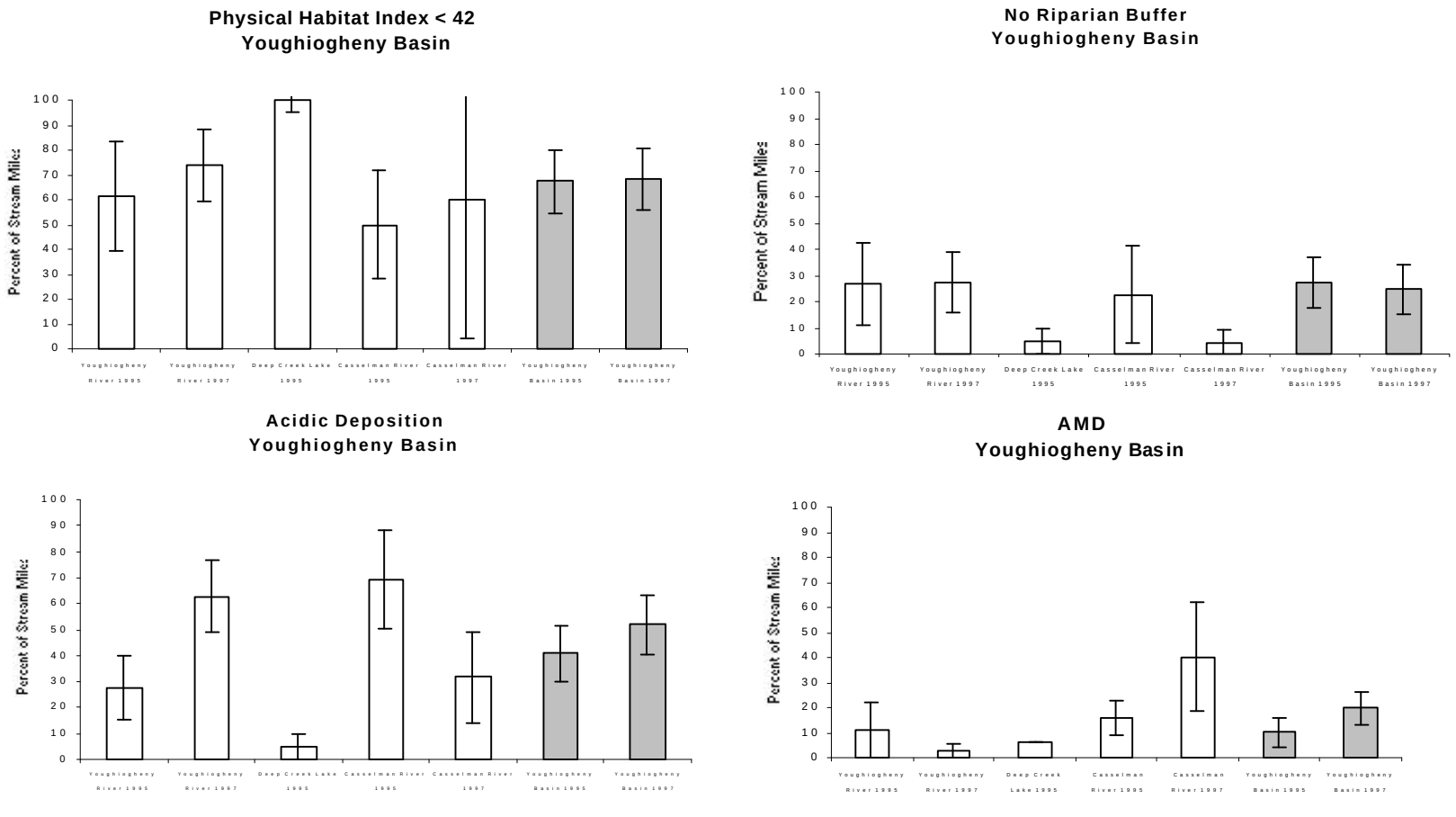


Youghiogheny Basin

Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
05020201	Youghiogheny River - 1995	23	19
05020201	Youghiogheny River - 1997	25	25
05020202	Little Youghiogheny River- 1995	3	3
05020202	LittleYoughiogheny River - 1996	3	2
05020203	Deep Creek Lake - 1995	4	4
05020203	Deep Creek Lake - 1997	3	3
05020204	Casselman River	11	11
0502024	Casselman River	13	13

Figure 3-17. Extent of the seven major anthropogenic stressors for the Maryland 8-digit watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Youghiogheny basin, 1995 and 1997 sampling. Error bars signify ±1 standard error.

4. FISH AND BENTHIC IBI SCORES

For the 1995-1997 MBSS, a fish Index of Biotic Integrity (IBI, Roth et al. 2000) and a benthic IBI (Stribling et al. 1998) were developed to assess the condition of biological resources throughout the state. These indicators provide a means for comparing sampling results to minimally impacted reference conditions (i.e., the biological community expected in watersheds with little or no human disturbance). Individual metrics that quantitatively describe attributes of the biological community are scored and combined into a single index. The following categories serve as guidelines for interpreting both the fish and benthic IBI scores:

- IBI scores of 4.0 to 5.0 are rated good, with attributes comparable to the upper 50% of reference site conditions.

- Scores of at least 3.0 but less than 4.0 are rated fair, generally meeting expectations when compared to reference conditions, but with attributes falling within the lower portion of the range of reference sites (10^{th} to 50^{th} percentile).

- Scores of at least 2.0 but less than 3.0 are rated poor, with attributes falling short of the expectations set by reference conditions and indicating degradation.

- Scores of less than 2.0 are rated very poor, with attributes falling even further short of reference expectations and indicating more severe degradation.

For the fish IBI, sites with a catchment area less than 300 acres were not rated. Also, no ratings were reported for sites identified as blackwater or as brook trout streams where fish IBI was less than 3.0. Benthic IBI sites were not rated only in a few cases where sampling problems resulted in a small sample size. The percentage of stream miles falling into each of the IBI categories for both the fish and benthic IBIs was calculated for the 8-digit watersheds containing four or more 1995-1997 MBSS sites. These estimates, along with their standard errors, can be found in Tables B-1 and B-2, Appendix B. Also included in Appendix B are: 1) estimates of the percentage of stream miles in each category of the Physical Habitat Index (Table B-3); 2) estimates of the percentage of stream miles that are channelized (Table B-4); 3) estimates of the percentage of stream miles with optimal, sub-optimal, marginal, and poor bank stability (Table B-5), and 4) the number of dams and other barriers to fish migration (Table B-6) in each 8-digit watershed with four or more MBSS sites.

DNR and MDE are using fish and benthic IBIs as provisional biological criteria indicating stream degradation. Currently, one option under consideration would use IBI scores of 2.25 or less to designate waters as degraded. This threshold includes all very poor and some poor sites; use of a threshold value less than 3.0 would allow for measurement error. A summary of the number of watersheds with at least one site falling into this category for either the fish or benthic IBI is shown in Table 4-1. Of the 138 Maryland 8-digit watersheds, only 106 were sampled by the MBSS (some

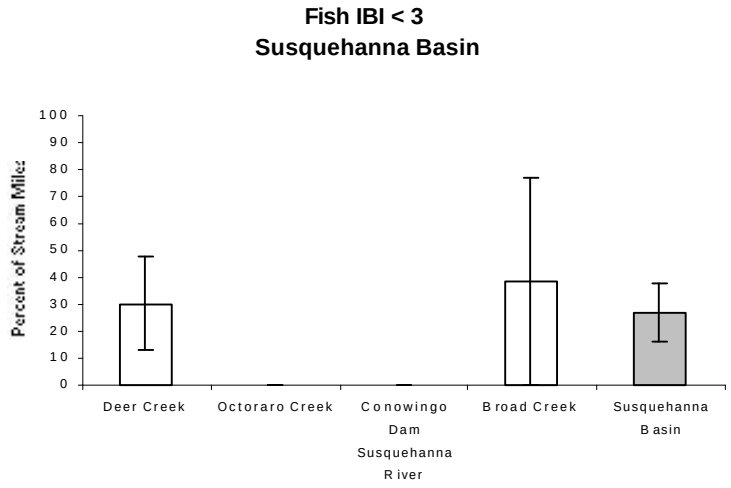
watersheds are located in the Chesapeake Bay or its tidal reaches), so that is the maximum attainable in any category. Also included in this table are the numbers of watersheds with at least one site with IBI scores greater than 2.25 but less than 3.0; these sites may warrant additional monitoring to confirm degradation. The number of sites in each watershed with four or more MBSS sites for these two categories is included in Tables C-1 and C-2, Appendix C.

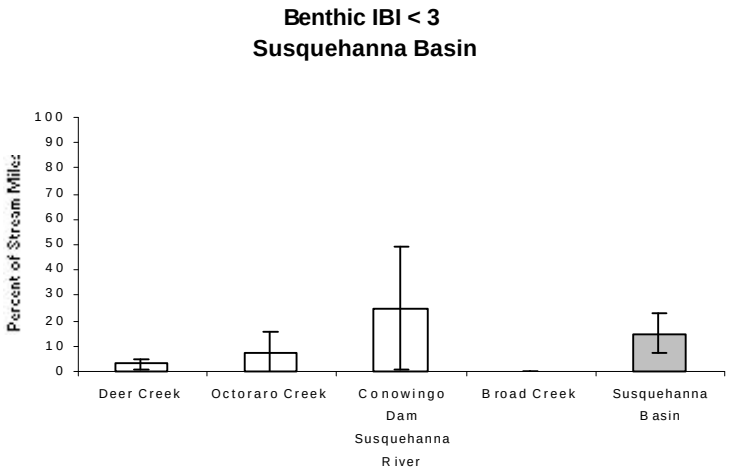
Table 4-1. The number of Maryland 8-digit watersheds with at least one site having a fish or benthic IBI score less than 2.25 and between 2.25 and 3.0

	Number of Watersheds With at Least One Site < 2.25	**Number of Watersheds With at Least One Site > 2.25 and < 3.0**
Fish IBI Only	52	51
Benthic IBI Only	82	74
Both Fish and Benthic IBI	32	41
Either Fish or Benthic IBI	102	84

Figures 4-1 through 4-17 illustrate the percentage of stream miles that fall below 3.0 (rated poor or very poor) for the fish and benthic IBIs. The figures are organized by major drainage basin and are accompanied by a list of the watersheds in each basin and the number of spring and summer 1995-1997 MBSS sites located in these watersheds. As described in Section 3, only watersheds with four or more MBSS sites are included in the figures.

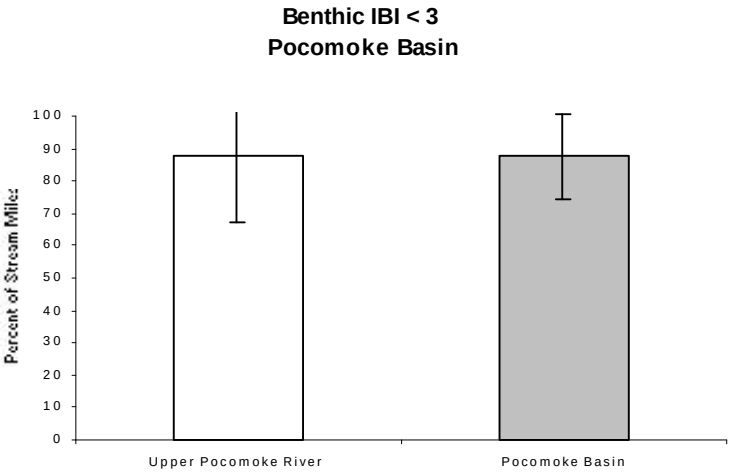
As with the stressor figures described in Section 3, figures illustrating the extent of biological impact can be used to target restoration efforts. For example, Figure 4-15 describes the Upper Potomac basin, in which only the Potomac River - Washington County watershed had more than 50% of the stream miles with fish IBI scores less than 3.0. Only this watershed and Sideling Hill Creek had greater than 50% of stream miles scoring less than 3.0 for the benthic IBI. Conversely, less than 20% of the stream miles in Town Creek watershed scored in the poor to very poor range for both the fish and the benthic IBIs. These results imply that if biology is used as criteria for evaluating degradation, watershed restoration efforts in the Upper Potomac basin should be focused in the Potomac River - Washington County and Sideling Hill Creek watersheds. Further monitoring in the remaining watersheds may be warranted before restoration efforts are initiated. The remaining graphs of watershed condition should be interpreted in a similar fashion. The actual estimates, including the standard errors, of the percentage of stream miles less than 3.0 for both the fish and benthic IBIs, by watershed and major drainage basin, are also included in Tables C-1 and C-2, Appendix C.





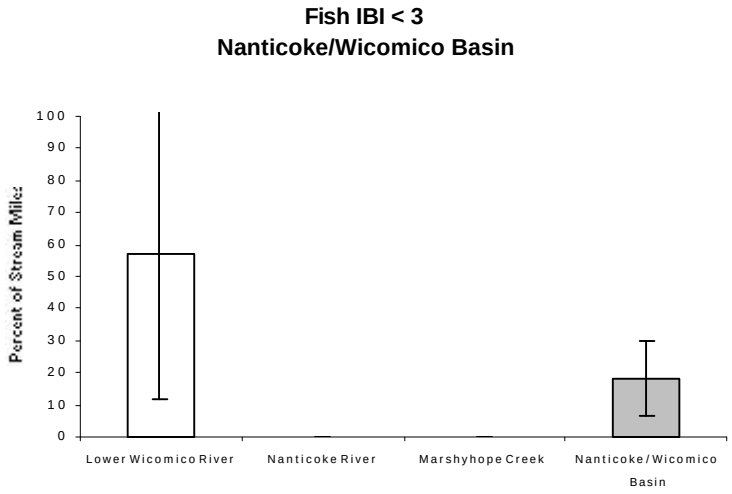
Susquehanna Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02120201	L Susquehanna River	3	3
02120202	Deer Creek	18	18
02120203	Octoraro Creek	5	5
02120204	Conowingo Dam Susquehanna R.	4	4
02120205	Broad Creek	7	5

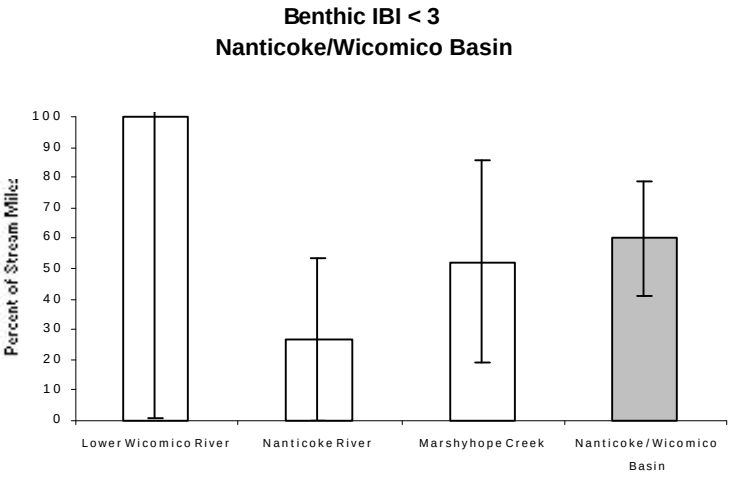
Figure 4-1. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Susquehanna basin. Error bars signify ±1 standard error.



Pocomoke Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130201	Pocomoke Sound	2	1
02130202	Lower Pocomoke River	2	1
02130203	Upper Pocomoke River	24	22
02130204	Dividing Creek	0	0
02130205	Nassawango Creek	3	2
02130206	Tangier Sound	0	0
02130207	Big Annemessex River	0	0
02130208	Manokin River	2	2

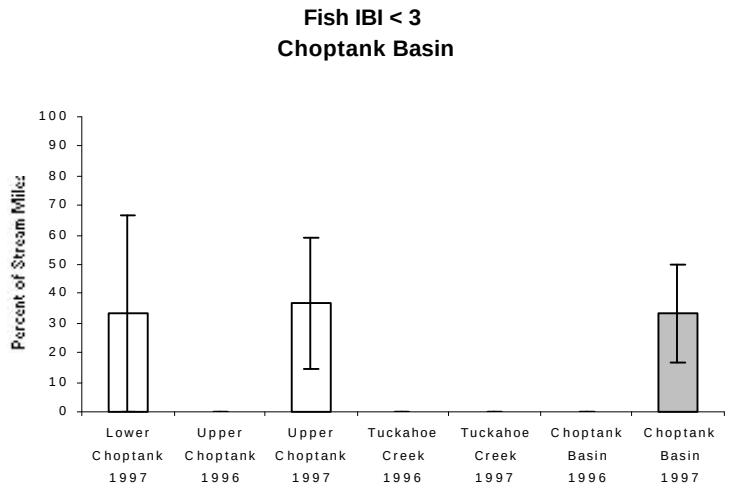
Figure 4-2. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Pocomoke basin. Error bars signify ±1 standard error.

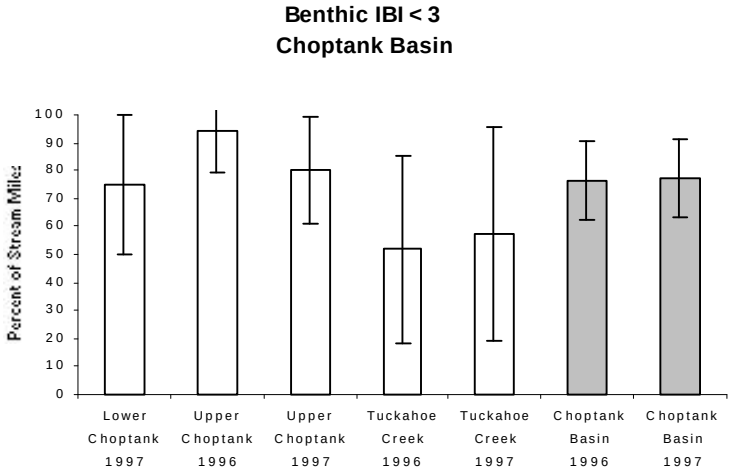




Nanticoke/Wicomico Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130301	Lower Wicomico River	4	3
02130302	Monie Bay	0	0
02130303	Wicomico Creek	1	1
02130304	Wicomico River Head	3	3
02130305	Nanticoke River	4	4
02130306	Marshyhope Creek	5	5
02130307	Fishing Bay	0	0
02130308	Transquaking River	1	1

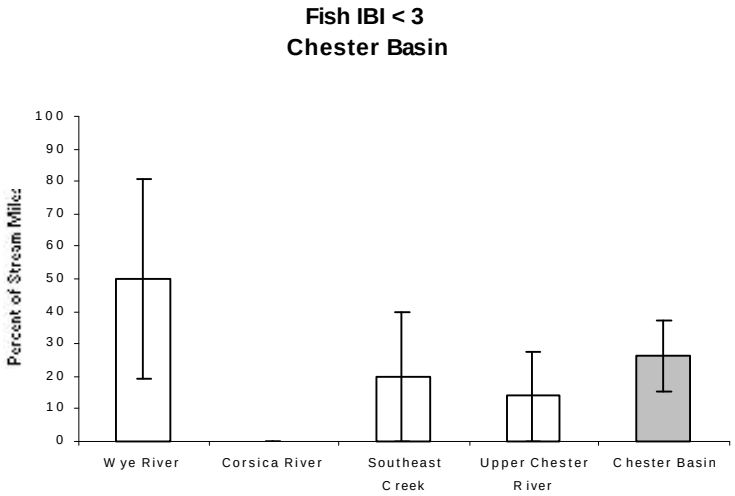
Figure 4-3. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Nanticoke/Wicomico basin. Error bars signify ±1 standard error.

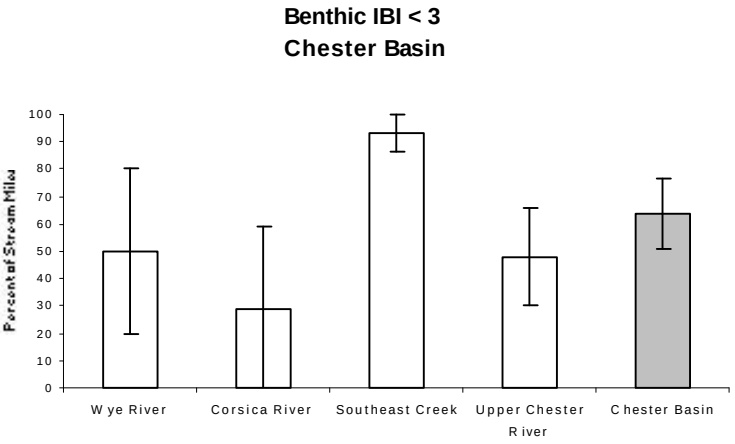




Choptank Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130401	Honga River - 1996	0	0
02130401	Honga River - 1997	0	0
02130402	Little Choptank - 1996	0	0
02130402	Little Choptank - 1997	0	0
02130403	Lower Choptank - 1996	2	1
02130403	Lower Choptank - 1997	4	3
02130404	Upper Choptank - 1996	9	7
02130404	Upper Choptank - 1997	14	9
02130405	Tuckahoe Creek - 1996	10	10
02130405	Tuckahoe Creek - 1997	7	7

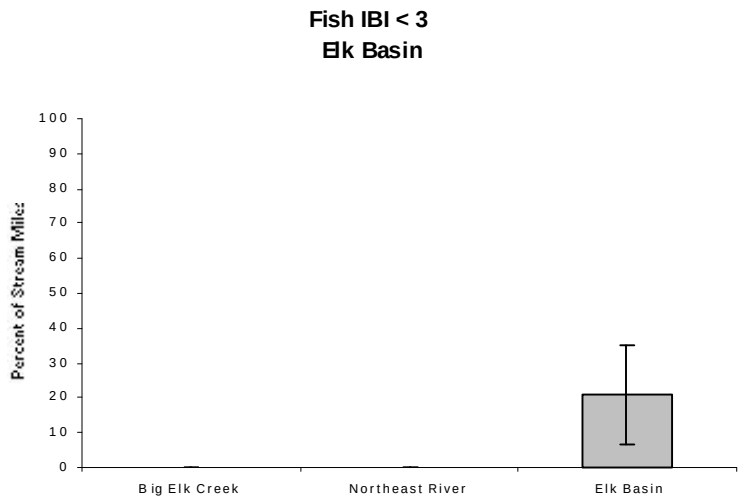
Figure 4-4. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Choptank basin, 1996 and 1997 sampling. Error bars signify ±1 standard error.

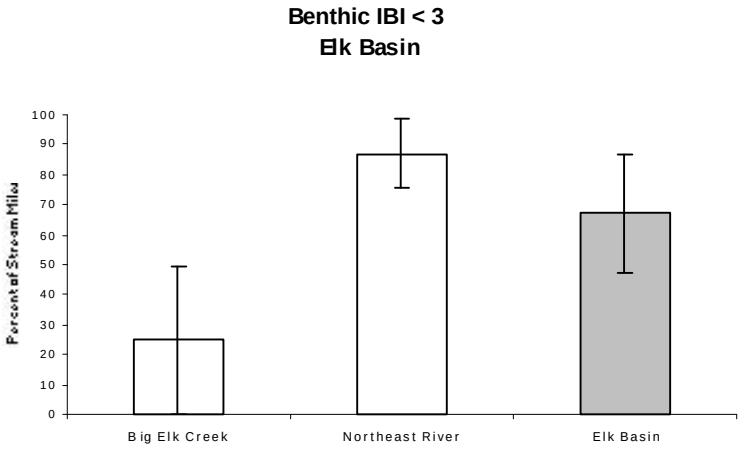




Chester River - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130501	Eastern Bay	0	0
02130502	Miles River	0	0
02130503	Wye River	4	4
02130504	Kent Narrows	0	0
02130505	Lower Chester River	2	2
02130506	Langford Creek	1	1
02130507	Corsica River	6	6
02130508	Southeast Creek	6	5
02130509	Middle Chester River	2	2
02130510	Upper Chester River	21	19
02130511	Kent Island Bay	0	0

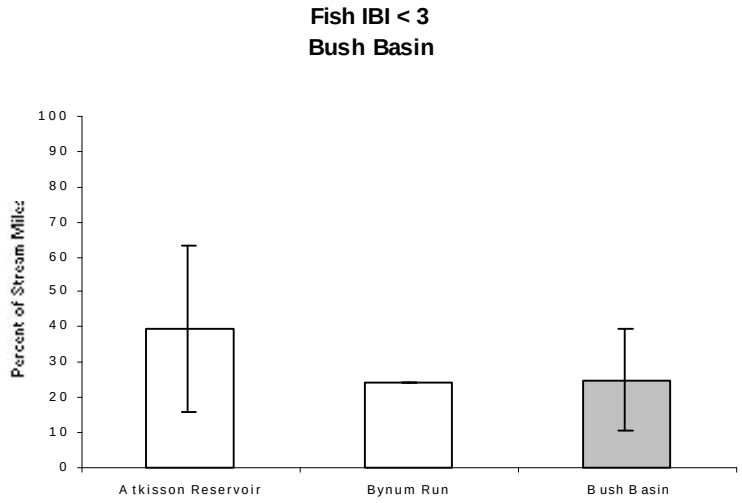
Figure 4-5. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Chester basin. Error bars signify ±1 standard error.

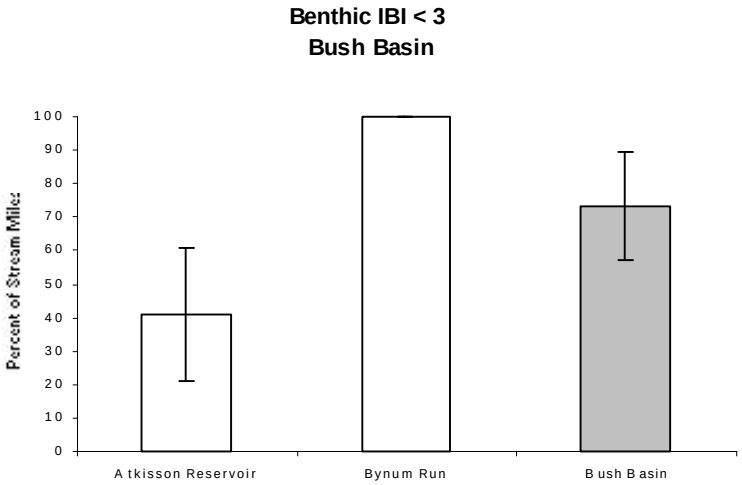




Elk Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130601	Lower Elk River	0	0
02130602	Bohemia River	0	0
02130603	Upper Elk River	0	0
02130604	Back Creek	0	0
02130605	Little Elk Creek	3	3
02130606	Big Elk Creek	4	4
02130607	Christina River	1	1
02130608	Northeast River	6	6
02130609	Furnace Bay	3	3
02130610	Sassafras River	0	0
02130611	Stillpond-Fairlee	0	0

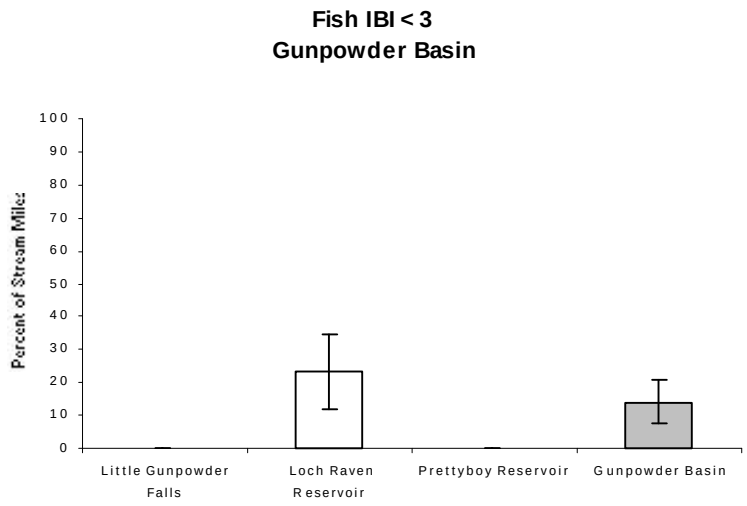
Figure 4-6. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Elk basin. Error bars signify ±1 standard error.

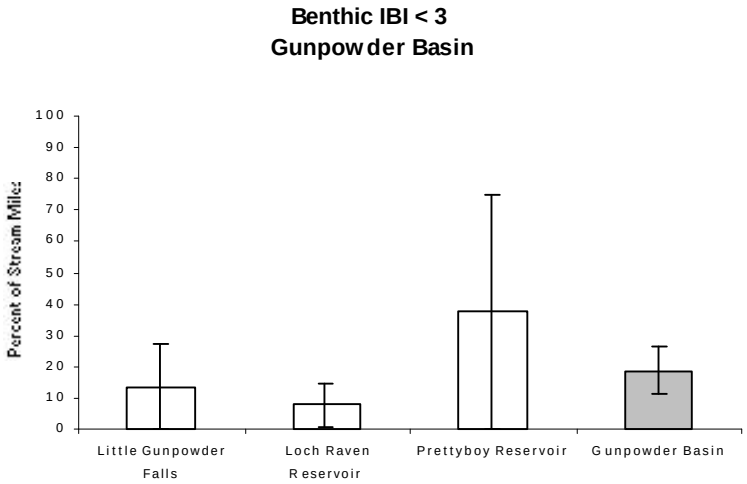




Bush Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130701	Bush River	2	2
02130702	Lower Winters Run	3	3
02130703	Atkisson Reservoir	6	6
02130704	Bynum Run	5	5
02130705	Aberdeen Proving Ground	1	0
02130706	Swan Creek	3	3

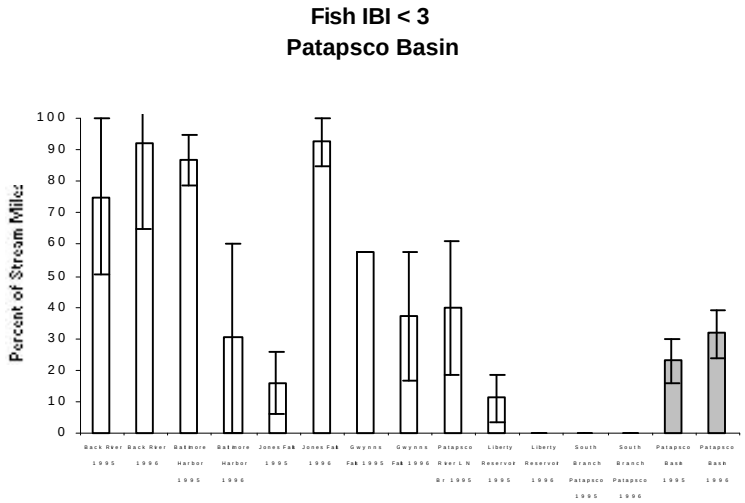
Figure 4-7. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Bush basin. Error bars signify ±1 standard error.

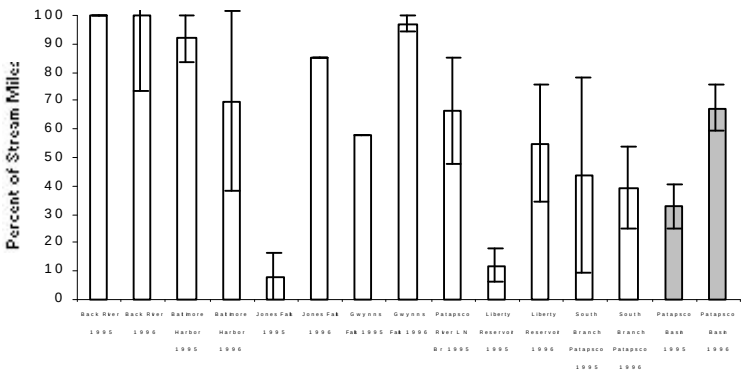




Gunpowder Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130801	Gunpowder River	0	0
02130802	Lower Gunpowder Falls	3	3
02130803	Bird River	0	0
02130804	Little Gunpowder Falls	8	8
02130805	Loch Raven Reservoir	25	25
02130806	Prettyboy Reservoir	9	9
02130807	Middle River - Browns	0	0

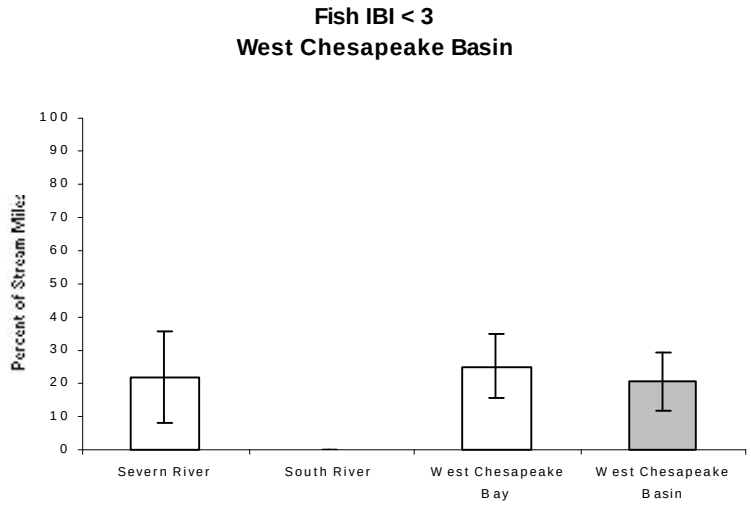
Figure 4-8. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Gunpowder basin. Error bars signify ±1 standard error.

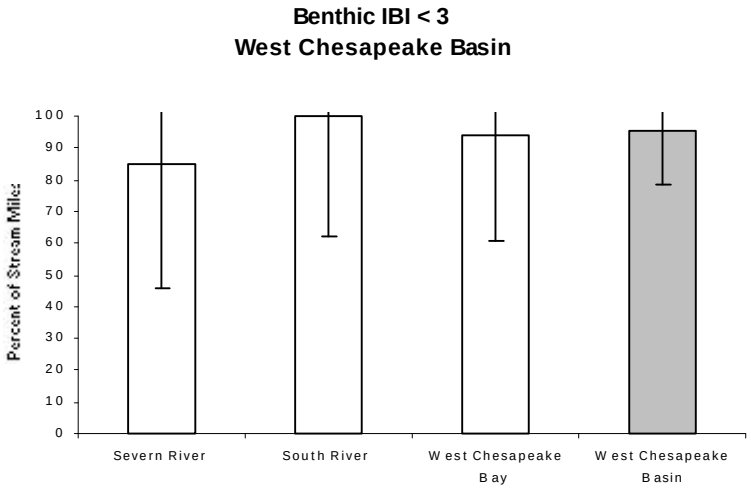




Patapsco Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02130901	Back River - 1995	4	4
02130901	Back River - 1996	8	8
02130902	Bodkin Creek - 1995	0	0
02130902	Bodkin Creek - 1996	0	0
02130903	Baltimore Harbor - 1995	4	4
02130903	Baltimore Harbor - 1996	4	4
02130904	Jones Falls - 1995	5	5
02130904	Jones Falls - 1996	5	5
02130905	Gwynns Falls - 1995	4	4
02130905	Gwynns Falls - 1996	12	12
02130906	Patapsco River L N Br - 1995	14	14
02130906	Patapsco River L N Br - 1996	3	3
02130907	Liberty Reservoir - 1995	19	19
02130907	Liberty Reservoir - 1996	18	16
02130908	S Branch Patapsco - 1995	11	11
02130908	S Branch Patapsco - 1996	18	17

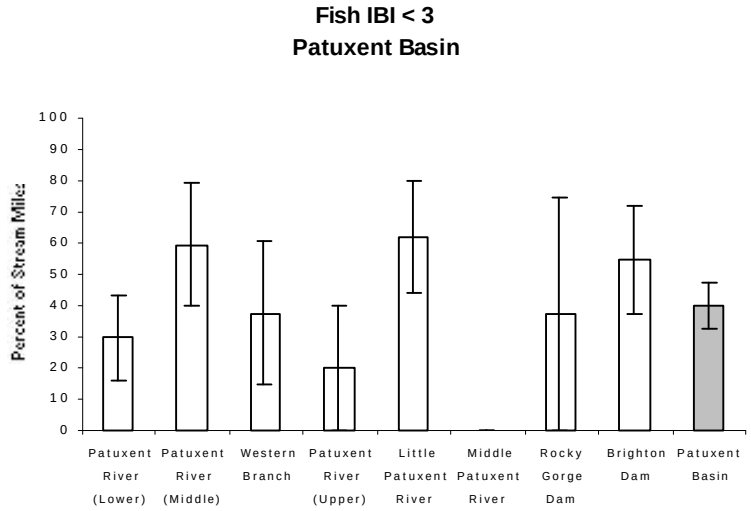
Figure 4-9. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds, with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Patapsco basin, 1995 and 1996 sampling. Error bars signify ±1 standard error.

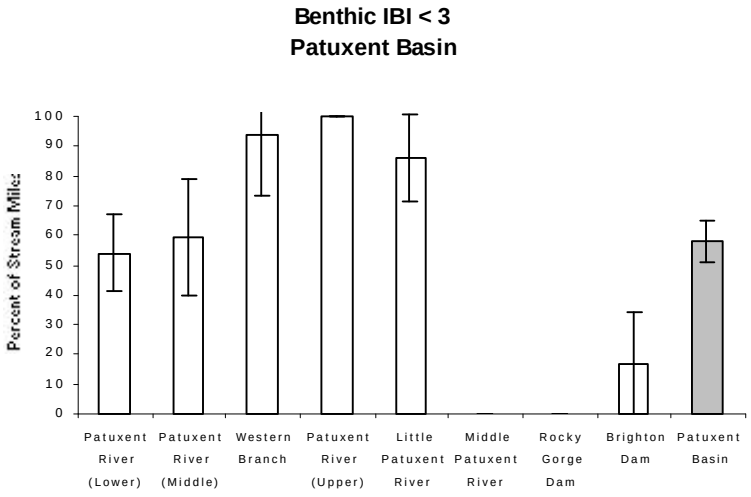




West Chesapeake Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02131001	Magothy River	3	3
02131002	Severn River	15	15
02131003	South River	4	2
02131004	West River	3	2
02131005	West Chesapeake Bay	10	10

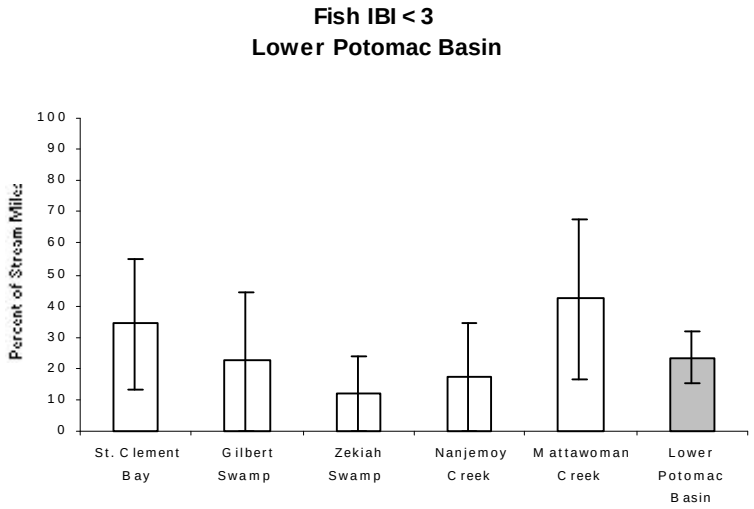
Figure 4-10. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the West Chesapeake basin. Error bars signify ±1 standard error.

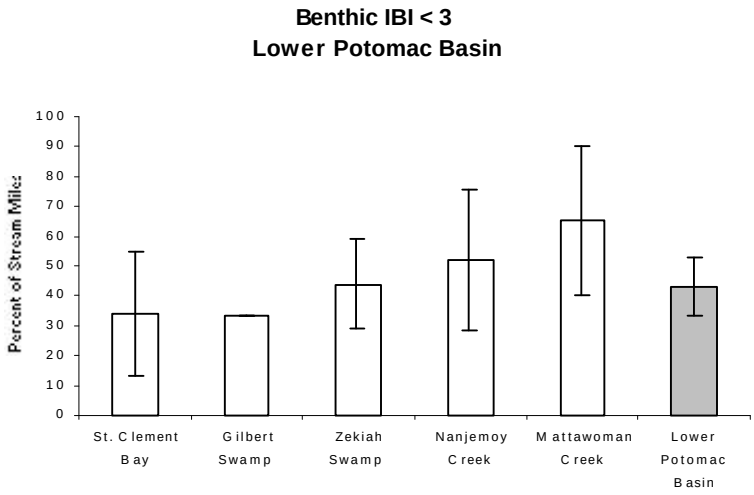




Patuxent Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02131101	Patuxent River Lower	18	16
02131102	Patuxent River Middle	7	7
02131103	Western Branch	11	11
02131104	Patuxent River Upper	5	5
02131105	Little Patuxent River	14	14
02131106	Middle Patuxent River	5	5
02131107	Rocky Gorge Dam	6	6
02131108	Brighton Dam	16	16

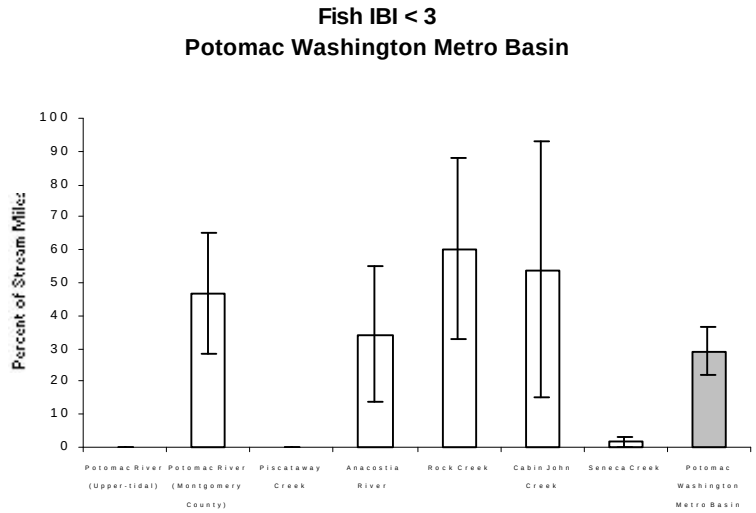
Figure 4-11. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Patuxent basin. Error bars signify ±1 standard error.

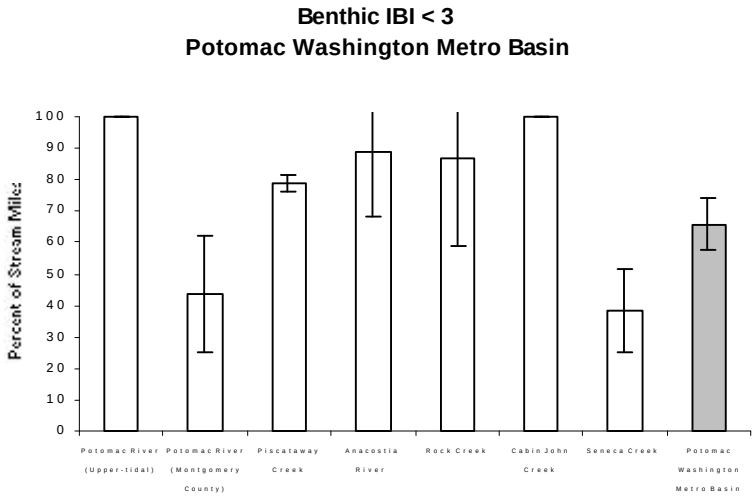




Lower Potomac Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140101	Potomac River L tidal	0	0
02140102	Potomac River M tidal	3	3
02140103	St. Mary's River	2	2
02140104	Breton Bay	2	2
02140105	St. Clement Bay	7	7
02140106	Wicomico River	2	1
02140107	Gilbert Swamp	4	4
02140108	Zekiah Swamp	19	17
02140109	Port Tobacco River	1	1
02140110	Nanjemoy Creek	8	8
02140111	Mattawoman Creek	6	5

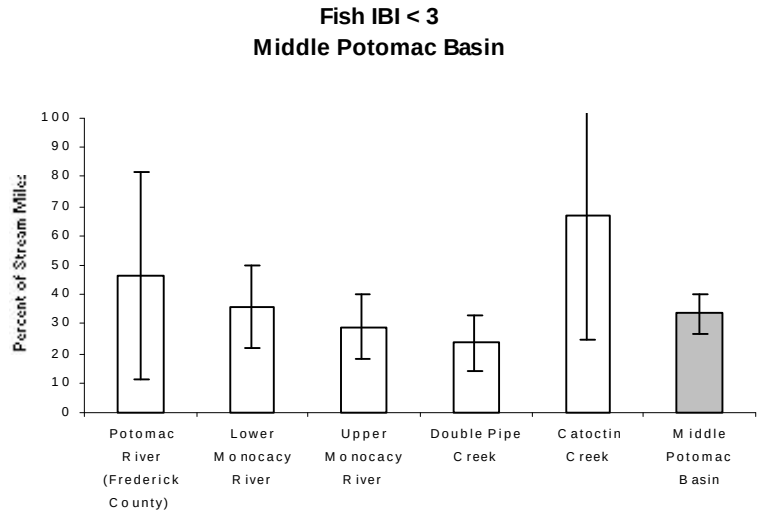
Figure 4-12. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Lower Potomac basin. Error bars signify ±1 standard error.

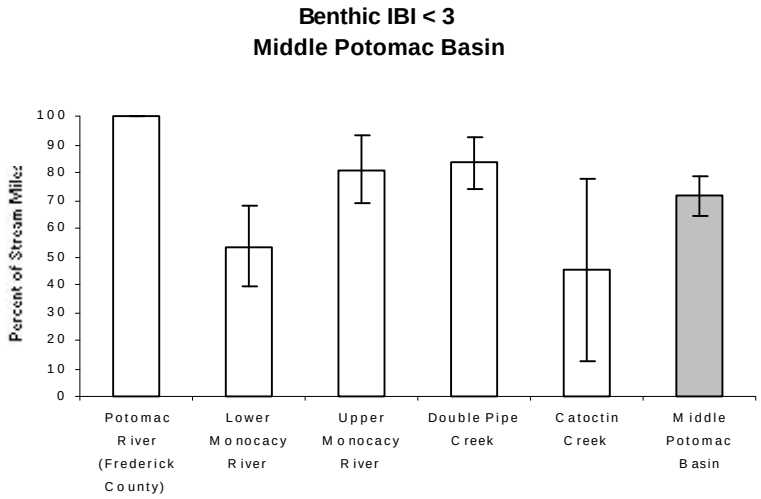




Potomac Washington Metro Basin - 1995-1997 sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140201	Potomac River U tidal	4	4
02140202	Potomac River MO Cnty	12	12
02140203	Piscataway Creek	5	4
02140204	Oxon Creek	0	0
02140205	Anacostia River	18	18
02140206	Rock Creek	9	9
02140207	Cabin John Creek	5	5
02140208	Seneca Creek	18	18

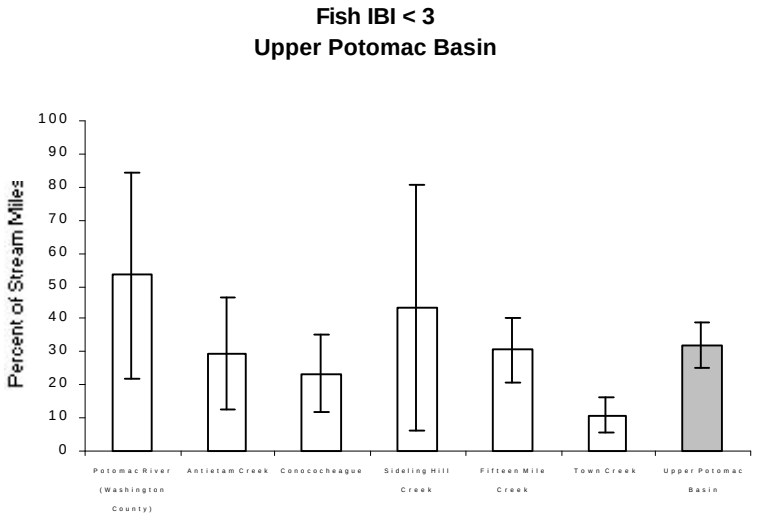
Figure 4-13. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Potomac Washington Metro basin. Error bars signify ±1 standard error.

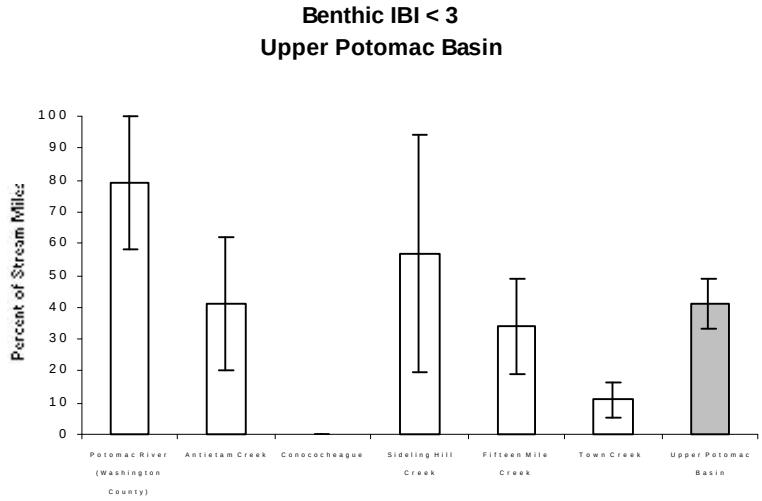




Middle Potomac Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140301	Potomac River FR Cnty	8	7
02140302	Lower Monocacy River	33	33
02140303	Upper Monocacy River	36	36
02140304	Double Pipe Creek	28	28
02140305	Catoctin Creek	4	3

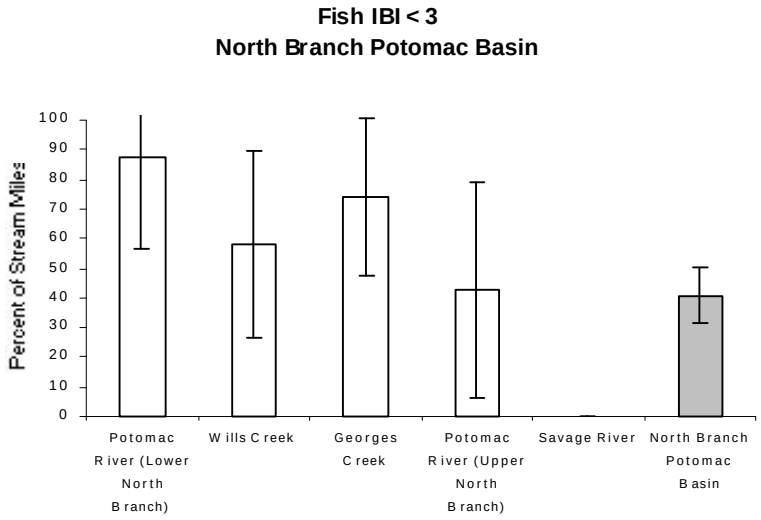
Figure 4-14. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Middle Potomac basin. Error bars signify ±1 standard error.

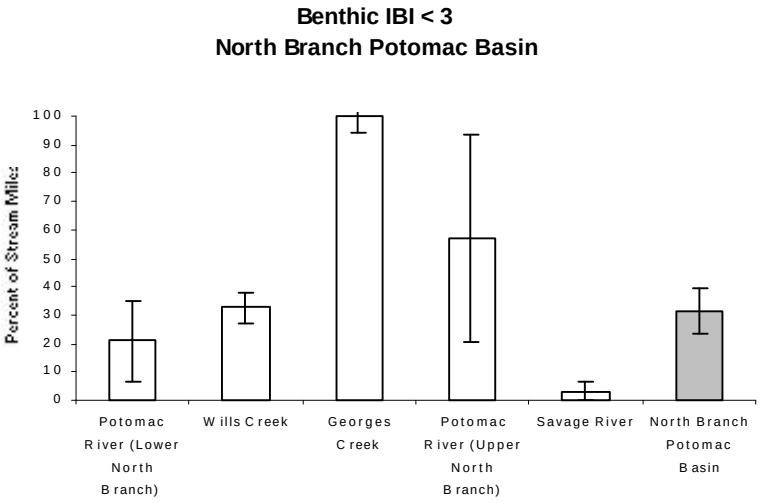




Upper Potomac Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02140501	Potomac River WA Cnty	5	4
02140502	Antietam Creek	15	15
02140503	Marsh Run	2	2
02140504	Conococheague	4	4
02140505	Little Conococheague	3	3
02140506	Licking Creek	1	1
02140507	Tonoloway Creek	0	0
02140508	Potomac River AL Cnty	3	3
02140509	Little Tonoloway Creek	3	3
02140510	Sideling Hill Creek	6	6
02140511	Fifteen Mile Creek	20	17

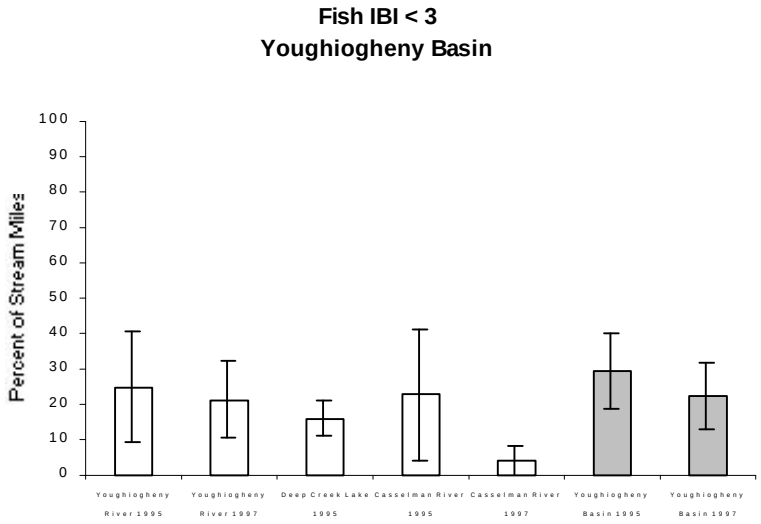
Figure 4-15. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Upper Potomac basin, 1996 and 1997 sampling. Error bars signify ±1 standard error.

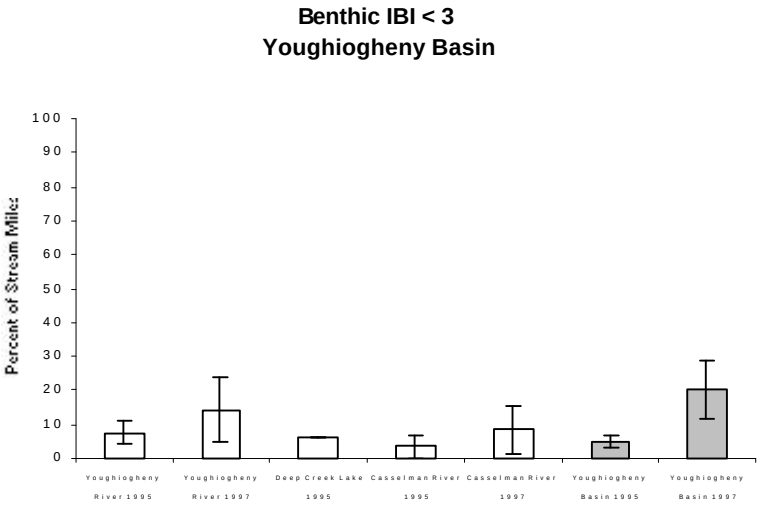




North Branch Potomac Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
02141001	Potomac River Lower North Branch	18	14
02141002	Evitts Creek	3	2
02141003	Wills Creek	6	6
02141004	Georges Creek	7	7
02141005	Potomac River U N Branch	9	9
02141006	Savage River	19	19

Figure 4-16. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the North Branch Potomac basin. Error bars signify ±1 standard error.





Youghiogheny Basin - 1995-1997 MBSS sampling			
Watershed Code	Watershed Name	Number of Spring Sites	Number of Summer Sites
05020201	Youghiogheny River - 1995	23	19
05020201	Youghiogheny River - 1997	25	25
05020202	Little Youghiogheny River- 1995	3	3
05020202	LittleYoughiogheny River - 1996	3	2
05020203	Deep Creek Lake - 1995	4	4
05020203	Deep Creek Lake - 1997	3	3
05020204	Casselman River	11	11
05020204	Casselman River	13	13

Figure 4-17. Percentage of stream miles that score < 3.0 (poor to very poor) for the fish and benthic IBIs in watersheds with four or more 1995-1997 MBSS sites, including basinwide estimates, for the Youghiogheny basin, 1995 and 1997 sampling. Error bars signify ±1 standard error.

5. CONCLUSIONS

Even though the 1995-1997 MBSS sampling was not designed to produce estimates of stream condition on the watershed scale, post-stratification can generate meaningful results. These results can help target watersheds deserving of additional attention. Managers can then focus a more intensive sampling effort in watersheds that (1) appear to be contributing the most to the degradation of water quality or (2) were not well represented in the 1995-1997 MBSS data. After that preliminary step to confirm watershed condition, restoration efforts can be made, with a fairly high level of confidence, in the watersheds that are most severely damaged.

Users of 1995-1997 MBSS data at the Maryland 8-digit watershed scale should remember that the Survey was designed as a statewide assessment; its randomly selected sites may not be the optimal set for characterizing conditions in a particular watershed. The watershed estimates presented should serve as only one of several tools for ranking and evaluating watershed conditions. Development of appropriate management measures to improve stream quality should incorporate other available information on the current and potential stressors within a particular watershed. This could include data from other stream monitoring programs, land use data, known problem locations, point source data, and local knowledge. Nonetheless, because the MBSS provides statewide data collected with consistent methods, it can make a valuable contribution to Maryland's watershed restoration efforts. As the efforts move forward, data may also be sought at the 12-digit subwatershed scale (of which there are 1166 in Maryland). Future sampling rounds of the MBSS provide the opportunity to obtain additional information at finer scales. In fact, the design to be implemented in MBSS 2000-2004 sampling will focus on providing watershed-level information along with Statewide estimates.

6. REFERENCES

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APPENDIX A

PERCENTAGE OF STREAM MILES FOR EACH MAJOR ANTHROPOGENIC STRESSOR FOR SELECTED MARYLAND 8-DIGIT WATERSHEDS

Table A-1. Percentage of stream miles of each of the seven major anthropogenic stressors for the 8-digit watersheds with four or more 1995-1997 MBSS sites and for the 17 major drainage basins

Watershed	Urban Land Use > 25%	Std. Error	Agricultural Land Use > 75%	Std. Error	NO_3-N > 7 mg/l	Std. Error	PHI < 42	Std. Error	No Riparian Buffer	Std. Error	Acidic Deposition	Std. Error	AMD	Std. Error
Deer Creek	0.0	0.0	30.2	17.3	0.0	0.0	26.5	17.1	17.9	13.5	0.0	0.0	0.0	0.0
Octoraro Creek	0.0	0.0	53.8	59.2	0.0	0.0	0.0	0.0	76.9	57.8	0.0	0.0	0.0	0.0
Conowingo Dam Susquehanna River	0.0	0.0	100.0	0.0	25.0	24.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Broad Creek	0.0	0.0	58.0	26.8	0.0	0.0	46.2	49.2	0.0	0.0	0.0	0.0	0.0	0.0
Susquehanna Basin	**0.0**	**0.0**	**34.8**	**10.9**	**0.8**	**0.8**	**24.6**	**10.7**	**24.4**	**10.1**	**0.0**	**0.0**	**0.0**	**0.0**
Upper Pocomoke River	0.0	0.0	0.0	0.0	0.0	0.0	67.7	26.8	41.5	24.4	50.0	50.0	0.0	0.0
Pocomoke Basin	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**54.9**	**18.5**	**22.0**	**12.2**	**37.5**	**13.9**	**0.0**	**0.0**
Lower Wicomico River	0.0	0.0	0.0	0.0	0.0	0.0	100.0	54.3	0.0	0.0	0.0	0.0	0.0	0.0
Nanticoke River	0.0	0.0	0.0	0.0	0.0	0.0	53.4	34.7	0.0	0.0	53.4	37.7	0.0	0.0
Marshyhope Creek	0.0	0.0	0.0	0.0	47.7	29.3	52.3	33.4	26.2	26.2	0.0	0.0	0.0	0.0
Nanticoke/Wicomico Basin	**0.0**	**0.0**	**0.0**	**0.0**	**19.4**	**11.7**	**76.7**	**19.5**	**7.9**	**7.9**	**16.8**	**11.5**	**0.0**	**0.0**
Lower Choptank - 1997	0.0	0.0	50.0	28.8	25.0	25.0	66.7	38.4	0.0	0.0	0.0	0.0	0.0	0.0
Upper Choptank - 1996	0.0	0.0	19.6	14.9	0.0	0.0	45.9	25.7	0.0	0.0	41.1	19.4	0.0	0.0
Upper Choptank - 1997	0.0	0.0	3.0	3.0	11.2	11.2	57.7	25.5	0.0	0.0	14.2	11.6	0.0	0.0
Tuckahoe Creek - 1996	0.0	0.0	0.0	0.0	64.9	34.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tuckahoe Creek - 1997	0.0	0.0	0.0	0.0	37.4	37.2	10.1	6.7	42.4	37.6	0.0	0.0	0.0	0.0
Choptank Basin 1996	**0.0**	**0.0**	**18.7**	**11.2**	**24.3**	**12.7**	**24.7**	**14.8**	**0.0**	**0.0**	**32.6**	**13.8**	**0.0**	**0.0**
Choptank Basin 1997	**0.0**	**0.0**	**16.7**	**10.3**	**16.7**	**10.3**	**58.3**	**19.5**	**3.5**	**2.7**	**9.3**	**7.7**	**0.0**	**0.0**
Wye River	0.0	0.0	25.0	25.0	25.0	25.0	100.0	24.9	0.0	0.0	0.0	0.0	0.0	0.0
Corsica River	0.0	0.0	29.1	29.7	29.1	29.8	29.1	29.8	0.0	0.0	0.0	0.0	0.0	0.0
Southeast Creek	0.0	0.0	0.0	0.0	0.0	0.0	60.0	24.3	0.0	0.0	0.0	0.0	0.0	0.0
Upper Chester River	0.0	0.0	0.0	0.0	0.0	0.0	56.8	21.3	0.0	0.0	12.0	12.0	0.0	0.0
Chester Basin	**0.0**	**0.0**	**16.8**	**8.5**	**10.0**	**6.9**	**67.7**	**14.7**	**0.0**	**0.0**	**10.1**	**6.9**	**0.0**	**0.0**
Big Elk Creek	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northeast River	0.0	0.0	17.0	10.7	0.0	0.0	0.0	0.0	8.5	8.5	0.0	0.0	0.0	0.0
Elk Basin	**0.0**	**0.0**	**20.2**	**11.3**	**0.0**	**0.0**	**0.0**	**0.0**	**24.5**	**14.4**	**0.0**	**0.0**	**0.0**	**0.0**
Atkisson Reservoir	19.8	20.0	19.9	20.0	0.0	0.0	39.7	23.5	19.9	20.0	0.0	0.0	0.0	0.0
Bynum Run	0.0	0.0	0.0	0.0	0.0	0.0	24.2	0.0	18.9	18.7	0.0	0.0	0.0	0.0
Bush Basin	**24.1**	**14.1**	**20.4**	**13.6**	**0.0**	**0.0**	**35.6**	**16.5**	**25.1**	**14.9**	**0.0**	**0.0**	**0.0**	**0.0**
Little Gunpowder Falls	0.0	0.0	0.0	0.0	0.0	0.0	13.5	13.4	26.9	16.5	0.0	0.0	0.0	0.0
Loch Raven Reservoir	0.0	0.0	31.0	11.7	0.0	0.0	38.2	13.0	9.5	4.5	13.8	9.3	0.0	0.0
Prettyboy Reservoir	0.0	0.0	91.0	0.0	0.0	0.0	45.5	38.3	9.9	8.3	0.0	0.0	0.0	0.0
Gunpowder Basin	**0.0**	**0.0**	**29.2**	**8.5**	**0.0**	**0.0**	**35.4**	**9.4**	**20.0**	**7.2**	**7.9**	**5.5**	**0.0**	**0.0**

Table A-1. (Continued)

Watershed	Urban Land Use > 25%	Std. Error	Agricultural Land Use > 75%	Std. Error	NO_3-N > 7 mg/l	Std. Error	PHI < 42	Std. Error	No Riparian Buffer	Std. Error	Acidic Deposition	Std. Error	AMD	Std. Error
Back River - 1995	100.0	0.0	0.0	0.0	0.0	0.0	25.0	24.9	100.0	0.0	0.0	0.0	0.0	0.0
Back River - 1996	100.0	26.1	0.0	0.0	0.0	0.0	34.2	27.6	100.0	26.2	0.0	0.0	0.0	0.0
Baltimore Harbor - 1995	91.9	8.1	0.0	0.0	0.0	0.0	78.5	0.0	13.4	8.1	0.0	0.0	0.0	0.0
Baltimore Harbor - 1996	60.4	30.1	0.0	0.0	0.0	0.0	90.6	0.0	60.4	30.1	30.2	30.1	0.0	0.0
Jones Falls - 1995	0.0	0.0	0.0	0.0	0.0	0.0	38.1	38.3	54.0	38.9	0.0	0.0	0.0	0.0
Jones Falls - 1996	84.9	0.0	0.0	0.0	0.0	0.0	36.1	36.1	92.5	7.5	0.0	0.0	0.0	0.0
Gwynns Falls - 1995	57.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gwynns Falls - 1996	74.1	20.4	20.2	20.2	0.0	0.0	60.5	0.0	28.7	20.5	0.0	0.0	0.0	0.0
Patapsco River Lower North Branch - 1995	84.7	4.6	0.0	0.0	0.0	0.0	39.8	21.2	48.3	21.5	0.0	0.0	0.0	0.0
Liberty Reservoir - 1995	0.0	0.0	40.5	13.3	12.4	8.5	15.7	8.7	24.4	10.3	0.0	0.0	0.0	0.0
Liberty Reservoir - 1996	0.0	0.0	52.1	50.6	16.2	16.3	21.8	17.1	39.7	17.8	0.0	0.0	0.0	0.0
South Branch Patapsco - 1995	0.0	0.0	45.6	34.6	32.8	32.7	37.2	1.7	47.4	34.6	0.0	0.0	0.0	0.0
South Branch Patapsco - 1996	0.0	0.0	60.2	11.5	0.0	0.0	22.5	14.2	37.1	15.2	0.0	0.0	0.0	0.0
Patapsco Basin 1995	**28.8**	**7.6**	**24.4**	**7.8**	**10.2**	**5.7**	**29.0**	**8.2**	**36.2**	**8.2**	**0.0**	**0.0**	**0.0**	**0.0**
Patapsco Basin 1996	**39.0**	**8.2**	**32.7**	**7.9**	**3.3**	**3.3**	**42.1**	**8.7**	**53.9**	**8.0**	**3.3**	**3.3**	**0.0**	**0.0**
Severn River	66.8	38.6	0.0	0.0	0.0	0.0	46.7	42.6	0.0	0.0	0.0	0.0	0.0	0.0
South River	0.0	0.0	0.0	0.0	0.0	0.0	50.0	49.8	0.0	0.0	41.5	31.7	0.0	0.0
West Chesapeake Bay	0.0	0.0	0.0	0.0	0.0	0.0	90.2	33.5	0.0	0.0	0.0	0.0	0.0	0.0
West Chesapeake Basin	**20.6**	**9.8**	**0.0**	**0.0**	**0.0**	**0.0**	**77.7**	**18.7**	**0.0**	**0.0**	**16.8**	**9.8**	**0.0**	**0.0**
Patuxent River (Lower)	11.0	8.9	0.0	0.0	0.0	0.0	72.1	9.0	9.0	9.0	35.6	13.3	0.0	0.0
Patuxent River (Middle)	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	23.0	19.8	40.0	22.9	0.0	0.0
Western Branch	28.8	19.5	0.0	0.0	0.0	0.0	66.3	23.8	28.6	19.7	0.0	0.0	0.0	0.0
Patuxent River (Upper)	60.0	24.5	0.0	0.0	0.0	0.0	40.0	24.5	20.0	20.0	0.0	0.0	0.0	0.0
Little Patuxent River	72.0	15.4	0.0	0.0	0.0	0.0	61.9	14.7	50.0	17.9	0.0	0.0	0.0	0.0
Middle Patuxent River	0.0	0.0	8.7	9.2	0.0	0.0	8.7	9.2	8.7	9.2	0.0	0.0	0.0	0.0
Rocky Gorge Dam	0.0	0.0	0.0	0.0	0.0	0.0	41.6	37.2	0.0	0.0	0.0	0.0	0.0	0.0
Brighton Dam	0.0	0.0	36.3	19.8	17.1	17.1	20.7	17.4	51.2	17.1	0.0	0.0	0.0	0.0
Patuxent Basin	**24.4**	**6.1**	**5.3**	**3.2**	**2.2**	**2.2**	**46.4**	**7.3**	**25.4**	**6.1**	**13.4**	**4.8**	**0.0**	**0.0**
St. Clement Bay	17.1	17.0	0.0	0.0	0.0	0.0	51.2	20.8	0.0	0.0	34.1	20.8	0.0	0.0
Gilbert Swamp	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Zekiah Swamp	10.5	10.4	0.0	0.0	10.5	10.4	41.2	17.4	14.8	12.3	89.5	10.8	0.0	0.0
Nanjemoy Creek	0.0	0.0	0.0	0.0	0.0	0.0	51.8	23.6	6.9	7.0	100.0	25.0	0.0	0.0
Mattawoman Creek	0.0	0.0	0.0	0.0	0.0	0.0	21.0	20.9	0.0	0.0	100.0	13.0	0.0	0.0
Lower Potomac Basin	**23.1**	**8.2**	**0.0**	**0.0**	**3.7**	**3.7**	**53.7**	**10.8**	**7.4**	**4.4**	**78.6**	**10.1**	**0.0**	**0.0**

Table A-1. (Continued)

Watershed	Urban Land Use > 25%	Std. Error	Agricultural Land Use > 75%	Std. Error	NO_3-N > 7 mg/l	Std. Error	PHI < 42	Std. Error	No Riparian Buffer	Std. Error	Acidic Deposition	Std. Error	AMD	Std. Error
Potomac River (Upper-tidal)	100.0	0.0	0.0	0.0	0.0	0.0	38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Potomac River (Montgomery County)	21.7	15.5	44.9	18.3	0.0	0.0	74.1	16.0	51.7	18.8	0.0	0.0	0.0	0.0
Piscataway Creek	38.0	38.0	0.0	0.0	0.0	0.0	61.2	65.6	0.0	0.0	0.0	0.0	0.0	0.0
Anacostia River	82.0	21.1	0.0	0.0	0.0	0.0	62.1	21.4	40.9	20.6	19.9	20.0	0.0	0.0
Rock Creek	48.9	28.0	0.0	0.0	0.0	0.0	22.2	22.4	0.0	0.0	0.0	0.0	0.0	0.0
Cabin John Creek	61.7	38.2	0.0	0.0	0.0	0.0	48.1	39.0	7.8	7.7	0.0	0.0	0.0	0.0
Seneca Creek	8.8	8.8	43.4	14.3	0.0	0.0	50.5	13.9	22.5	11.7	0.0	0.0	0.0	0.0
Potomac Washington Metro Basin	**38.6**	**7.9**	**23.1**	**7.2**	**0.0**	**0.0**	**53.3**	**8.5**	**27.6**	**7.2**	**3.1**	**3.1**	**0.0**	**0.0**
Potomac River (Frederick County)	0.0	0.0	31.6	31.6	0.0	0.0	89.7	7.2	33.9	33.9	0.0	0.0	0.0	0.0
Lower Monocacy River	0.0	0.0	11.4	8.6	8.4	8.4	51.1	14.9	46.1	13.1	8.4	8.4	0.0	0.0
Upper Monocacy River	0.0	0.0	34.3	11.3	5.6	5.7	47.2	12.9	45.5	11.6	3.3	3.3	0.0	0.0
Double Pipe Creek	0.0	0.0	91.4	2.7	22.3	12.0	57.4	11.9	43.8	13.4	0.0	0.0	0.0	0.0
Catoctin Creek	0.0	0.0	27.4	27.4	27.4	27.4	100.0	44.7	66.7	42.1	0.0	0.0	0.0	0.0
Middle Potomac Basin	**0.0**	**0.0**	**42.9**	**7.0**	**11.9**	**4.9**	**58.2**	**7.4**	**46.6**	**6.6**	**2.8**	**2.2**	**0.0**	**0.0**
Potomac River (Washington County)	0.0	0.0	42.0	24.2	0.0	0.0	100.0	26.5	33.9	33.9	0.0	0.0	0.0	0.0
Antietam Creek	16.7	16.7	5.1	3.5	5.1	3.5	60.3	21.0	79.6	17.5	16.7	16.7	0.0	0.0
Conococheague	0.0	0.0	35.3	0.0	11.8	11.7	76.5	11.7	35.3	0.0	0.0	0.0	0.0	0.0
Sideling Hill Creek	0.0	0.0	0.0	0.0	0.0	0.0	50.0	37.2	13.4	9.0	86.7	37.5	0.0	0.0
Fifteen Mile Creek	0.0	0.0	0.0	0.0	0.0	0.0	93.3	23.1	13.0	7.2	85.5	11.7	0.0	0.0
Town Creek	0.0	0.0	0.0	0.0	0.0	0.0	86.7	5.5	3.9	3.9	43.3	38.2	0.0	0.0
Upper Potomac Basin	**3.0**	**3.0**	**13.1**	**5.2**	**2.5**	**1.4**	**73.1**	**8.7**	**33.1**	**7.9**	**40.3**	**21.9**	**0.0**	**0.0**
Potomac River (Lower North Branch)	0.0	0.0	0.0	0.0	0.0	0.0	62.9	25.6	41.7	25.4	18.4	14.0	13.7	13.7
Wills Creek	0.0	0.0	0.0	0.0	0.0	0.0	89.1	5.4	36.4	31.3	0.0	0.0	52.7	52.7
Georges Creek	0.0	0.0	0.0	0.0	0.0	0.0	88.9	6.8	16.7	6.8	31.5	26.5	57.4	26.5
Potomac River (Upper North Branch)	0.0	0.0	0.0	0.0	0.0	0.0	82.3	7.3	78.7	7.0	35.8	35.8	19.5	7.3
Savage River	0.0	0.0	0.0	0.0	0.0	0.0	47.9	17.6	17.6	12.6	96.9	16.0	15.1	12.4
North Branch Potomac Basin	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**65.5**	**10.6**	**32.2**	**9.0**	**43.2**	**8.8**	**24.9**	**7.6**
Youghiogheny River - 1995	0.0	0.0	0.0	0.0	0.0	0.0	61.5	22.0	26.7	15.7	37.6	12.2	11.2	11.2
Youghiogheny River -1997	0.0	0.0	0.0	0.0	0.0	0.0	73.7	14.5	27.5	11.6	62.9	14.0	2.8	2.8
Deep Creek Lake - 1995	0.0	0.0	0.0	0.0	0.0	0.0	100.0	4.9	5.0	4.9	5.0	4.9	6.1	0.0
Casselman River - 1995	0.0	0.0	0.0	0.0	0.0	0.0	49.8	21.8	22.7	18.7	69.4	19.0	15.7	6.8
Casselman River - 1997	0.0	0.0	0.0	0.0	0.0	0.0	59.8	55.6	4.2	4.7	31.8	17.5	40.2	21.7
Youghiogheny Basin 1995	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**67.5**	**12.8**	**27.4**	**9.8**	**40.9**	**10.8**	**10.1**	**5.9**
Youghiogheny Basin 1997	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**68.4**	**12.5**	**24.6**	**9.6**	**51.9**	**11.3**	**19.7**	**6.4**

APPENDIX B

PERCENTAGE OF STREAM MILES BY CATEGORY, FOR THE FISH IBI, BENTHIC IBI, AND PHYSICAL HABITAT PARAMETERS, WITHIN SELECTED MARYLAND 8-DIGIT WATERSHEDS

Table B-1. Estimated percent of stream miles in each fish IBI category and mean fish IBI for the 80 8-digit watersheds with 4 or more 1995-1997 MBSS sites

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error	Percent Rated	Mean Fish IBI	Std. Error
Deer Creek	27.2	13.6	16.2	13.4	30.2	17.3	0.0	0.0	73.6	3.6	0.9
Octoraro Creek	30.7	40.4	69.3	40.4	0.0	0.0	0.0	0.0	100.0	3.5	1.6
Conowingo Dam Susquehanna River	75.0	41.6	25.0	41.6	0.0	0.0	0.0	0.0	100.0	4.1	0.3
Broad Creek	22.9	12.8	0.0	0.0	0.0	0.0	38.5	38.7	61.4	2.8	1.4
Susquehanna Basin	**26.6**	**7.0**	**22.7**	**9.9**	**15.1**	**8.4**	**11.9**	**8.1**	**76.3**	**3.4**	**0.5**
Upper Pocomoke River	6.3	3.2	36.2	19.4	18.8	18.8	0.0	0.0	61.3	3.2	1.5
Pocomoke Basin	**12.5**	**9.8**	**48.1**	**17.4**	**9.7**	**9.7**	**0.0**	**0.0**	**70.4**	**2.4**	**0.7**
Lower Wicomico River	0.0	0.0	43.0	43.0	57.0	45.2	0.0	0.0	100.0	2.7	1.5
Nanticoke River	19.9	21.2	53.4	37.4	0.0	0.0	0.0	0.0	73.3	3.4	1.8
Marshyhope Creek	21.5	14.5	78.5	35.8	0.0	0.0	0.0	0.0	100.0	3.8	1.4
Nanticoke/Wicomico Basin	**3.9**	**2.2**	**69.6**	**19.1**	**18.1**	**11.6**	**0.0**	**0.00**	**70.4**	**2.9**	**0.6**
Lower Choptank 1997	0.0	0.0	33.3	33.2	0.0	0.0	33.3	33.2	66.0	2.8	1.8
Upper Choptank 1996	0.0	0.0	81.1	26.7	0.0	0.0	0.0	0.0	81.1	3.6	1.2
Upper Choptank 1997	13.9	8.5	32.7	21.9	37.0	22.2	0.0	0.0	83.6	3.1	1.0
Tuckahoe Creek 1996	93.0	33.4	7.0	7.2	0.0	0.0	0.0	0.0	100.0	4.2	1.4
Tuckahoe Creek 1997	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	1.4	0.5
Choptank Basin 1996	**33.4**	**15.1**	**55.9**	**18.7**	**0.0**	**0.0**	**0.0**	**0.0**	**89.3**	**3.4**	**0.8**
Choptank Basin 1997	**14.7**	**5.1**	**31.1**	**16.5**	**23.2**	**14.3**	**10.4**	**10.3**	**79.3**	**3.1**	**0.8**
Wye River	0.0	0.0	50.0	30.5	50.0	30.5	0.0	0.0	100.0	2.9	0.8
Corsica River	66.6	34.2	4.3	4.4	0.0	0.0	0.0	0.0	71.0	4.3	2.0
Southeast Creek	20.0	19.8	60.0	24.3	20.0	19.8	0.0	0.0	100.0	3.5	0.3
Upper Chester River	20.4	10.4	51.8	20.2	13.9	14.0	0.0	0.0	86.1	3.6	0.8
Chester Basin	**21.7**	**8.6**	**35.2**	**11.2**	**20.5**	**9.7**	**5.6**	**5.6**	**83.1**	**2.9**	**0.5**
Big Elk Creek	74.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.6	4.4	0.2
Northeast River	65.9	0.0	34.1	10.7	0.0	0.0	0.0	0.0	100.0	4.1	0.4
Elk Basin	**37.8**	**14.8**	**30.7**	**14.8**	**21.0**	**14.3**	**0.0**	**0.0**	**89.5**	**3.6**	**0.8**
Atkisson Reservoir	60.3	20.5	0.0	0.0	39.7	23.5	0.0	0.0	100.0	3.8	0.8
Bynum Run	75.8	0.0	0.0	0.0	24.2	0.0	0.0	0.0	100.0	4.0	0.1
Bush Basin	**33.4**	**12.1**	**20.4**	**11.8**	**25.0**	**14.6**	**0.0**	**0.0**	**78.8**	**3.6**	**0.7**
Little Gunpowder Falls	73.1	16.5	13.5	13.4	0.0	0.0	0.0	0.0	86.5	4.6	0.6
Loch Raven Reservoir	5.7	3.8	29.4	8.4	23.5	11.3	0.0	0.0	58.6	3.0	0.6
Prettyboy Reservoir	13.5	8.3	11.7	8.3	0.0	0.0	0.0	0.0	25.2	3.9	0.2
Gunpowder Basin	**21.1**	**7.1**	**24.9**	**6.3**	**14.1**	**6.7**	**0.0**	**0.0**	**60.1**	**3.0**	**0.5**

Table B-1. (Continued)

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error	Percent Rated	Mean Fish IBI	Std. Error
Back River - 1995	0.0	0.0	25.0	24.9	50.0	28.7	25.0	24.9	100.0	2.5	0.2
Back River - 1996	0.0	0.0	7.9	8.1	7.9	8.1	84.2	28.3	100.0	1.5	0.3
Baltimore Harbor - 1995	0.0	0.0	13.4	8.1	86.6	8.1	0.0	0.0	100.0	2.2	0.0
Baltimore Harbor - 1996	0.0	0.0	9.4	9.4	0.0	0.0	30.2	30.1	40.1	1.5	1.2
Jones Falls - 1995	0.0	0.0	7.9	8.4	15.9	9.9	0.0	0.0	23.8	2.8	0.2
Jones Falls - 1996	0.0	0.0	7.5	7.5	7.5	7.5	85.0	0.0	100.0	1.3	0.1
Gwynns Falls - 1995	42.5	0.0	0.0	0.0	57.4	0.0	0.0	0.0	100.0	3.5	0.1
Gwynns Falls - 1996	0.0	0.0	22.5	3.7	28.7	20.5	8.5	4.1	59.7	2.6	0.9
Patapsco River Lower North Branch - 1995	8.5	4.6	33.5	18.7	17.2	17.0	28.1	21.0	87.3	2.4	0.6
Liberty Reservoir - 1995	47.5	13.3	35.4	12.2	11.0	7.8	0.0	0.0	93.9	3.9	0.5
Liberty Reservoir - 1996	17.8	6.6	65.5	21.3	0.0	0.0	0.0	0.0	83.3	3.9	0.4
South Branch Patapsco - 1995	54.4	34.6	12.8	11.2	0.0	0.0	0.0	0.0	67.2	4.2	2.1
South Branch Patapsco - 1996	23.0	12.4	65.7	15.3	0.0	0.0	0.0	0.0	88.7	3.6	0.5
Patapsco Basin 1995	**32.3**	**7.6**	**27.7**	**7.1**	**14.5**	**5.3**	**8.6**	**4.9**	**83.1**	**3.4**	**0.4**
Patapsco Basin 1996	**10.7**	**4.0**	**37.7**	**7.9**	**6.0**	**3.5**	**25.6**	**7.4**	**80.1**	**2.8**	**0.3**
Severn River	0.0	0.0	41.2	20.0	22.1	13.7	0.0	0.0	63.3	2.8	0.6
South River	50.0	49.8	0.0	0.0	0.0	0.0	0.0	0.0	50.0	3.6	0.5
West Chesapeake Bay	0.0	0.0	1.4	1.4	12.6	7.4	12.6	7.4	26.6	2.2	0.5
West Chesapeake Basin	**9.3**	**7.9**	**7.6**	**2.8**	**8.4**	**3.3**	**12.4**	**8.2**	**37.7**	**2.7**	**0.9**
Patuxent River (Lower)	25.2	10.0	0.0	0.0	29.7	13.8	0.0	0.0	54.9	3.5	0.9
Patuxent River (Middle)	11.9	8.8	8.8	8.8	39.7	22.9	19.8	19.8	78.6	2.9	0.6
Western Branch	19.9	7.2	4.9	5.0	18.8	18.8	18.8	18.8	62.4	2.6	0.8
Patuxent River (Upper)	20.0	20.0	40.0	24.5	0.0	0.0	20.0	20.0	80.0	3.1	0.8
Little Patuxent River	6.0	4.5	17.9	14.1	62.1	17.9	0.0	0.0	86.0	2.7	0.5
Middle Patuxent River	0.0	0.0	100.0	36.9	0.0	0.0	0.0	0.0	100.0	3.7	1.4
Rocky Gorge Dam	7.0	7.0	55.7	37.8	37.2	37.2	0.0	0.0	100.0	3.1	0.4
Brighton Dam	10.7	3.1	24.4	17.7	37.8	20.0	17.1	17.1	100.0	2.9	0.2
Patuxent Basin	**14.3**	**3.6**	**23.4**	**5.7**	**31.0**	**6.7**	**9.0**	**4.3**	**77.6**	**3.0**	**0.3**
St. Clement Bay	14.7	0.0	17.1	17.0	17.1	17.0	17.1	17.0	66.0	2.6	1.0
Gilbert Swamp	33.3	0.0	44.5	22.0	22.2	22.0	0.0	0.0	100.0	3.3	0.2
Zekiah Swamp	49.1	16.3	14.8	12.3	12.0	12.0	0.0	0.0	75.9	3.8	0.9
Nanjemoy Creek	17.2	12.9	31.0	19.0	0.0	0.0	17.3	17.3	65.5	3.3	1.3
Mattawoman Creek	42.1	25.6	15.9	15.8	21.0	20.9	21.0	20.9	100.0	3.0	1.1
Lower Potomac Basin	**33.3**	**8.0**	**19.6**	**7.6**	**10.5**	**5.7**	**12.9**	**6.6**	**76.4**	**3.2**	**0.5**

Table B-1. (Continued)

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error	Percent Rated	Mean Fish IBI	Std. Error
Potomac River (Upper-tidal)	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0	3.4	0.1
Potomac River (Montgomery County)	0.0	0.0	38.2	18.3	40.1	18.8	6.8	4.1	85.1	2.7	0.5
Piscataway Creek	34.1	24.3	65.9	64.8	0.0	0.0	0.0	0.0	100.0	3.9	2.2
Anacostia River	7.8	4.7	18.0	6.7	11.1	5.6	23.2	20.3	60.1	2.7	0.2
Rock Creek	35.3	22.8	4.4	4.5	11.4	3.1	48.9	27.9	100.0	2.7	0.9
Cabin John Creek	0.0	0.0	7.8	7.7	7.8	7.7	46.1	39.0	61.7	2.0	1.1
Seneca Creek	25.3	10.7	29.2	12.9	0.0	0.0	1.6	1.6	56.1	4.0	0.9
Potomac Washington Metro Basin	**15.5**	**4.9**	**27.0**	**6.8**	**12.4**	**4.8**	**16.9**	**6.1**	**73.7**	**3.0**	**0.4**
Potomac River (Frederick County)	0.0	0.0	19.7	9.8	12.5	8.9	33.9	33.9	66.1	2.2	0.9
Lower Monocacy River	24.7	9.3	14.1	3.9	26.1	3.1	9.9	8.5	74.8	3.0	0.6
Upper Monocacy River	24.5	7.8	37.5	9.9	5.6	5.7	23.5	10.1	91.1	3.0	0.4
Double Pipe Creek	8.6	2.8	14.3	9.4	8.6	3.5	15.2	9.4	46.7	2.7	0.7
Catoctin Creek	0.0	0.0	0.0	0.0	33.3	33.3	33.3	33.3	66.6	1.9	1.3
Middle Potomac Basin	**18.5**	**3.8**	**21.6**	**4.4**	**14.7**	**4.8**	**18.9**	**5.4**	**71.7**	**2.9**	**0.3**
Potomac River (Washington County)	0.0	0.0	0.0	0.0	0.0	0.0	53.2	30.9	53.2	1.0	0.6
Antietam Creek	21.8	17.0	48.7	20.9	10.2	4.5	19.3	16.9	100.0	2.9	0.6
Conococheague	0.0	0.0	11.8	11.8	23.5	11.8	0.0	0.0	35.3	2.7	0.4
Sideling Hill Creek	0.0	0.0	20.0	9.8	6.7	7.0	36.7	36.8	63.4	1.9	0.8
Fifteen Mile Creek	5.0	2.5	13.0	7.2	6.5	5.3	24.1	8.9	48.6	2.2	0.2
Town Creek	3.9	3.9	9.4	6.7	5.5	5.5	5.5	5.5	24.3	3.0	0.9
Upper Potomac Basin	**8.0**	**3.8**	**18.4**	**5.3**	**9.4**	**2.6**	**22.9**	**6.8**	**58.7**	**2.4**	**0.3**
Potomac River (Lower North Branch)	0.0	0.0	8.8	6.7	38.0	34.8	39.0	24.9	85.8	1.9	0.6
Wills Creek	0.0	0.0	0.0	0.0	0.0	0.0	58.1	39.4	58.1	1.1	0.6
Georges Creek	0.0	0.0	0.0	0.0	11.1	6.8	63.0	26.7	74.1	1.3	0.4
Potomac River (Upper North Branch)	0.0	0.0	3.6	2.0	35.8	35.8	7.1	7.0	46.5	2.3	1.9
Savage River	47.7	16.5	16.4	5.8	0.0	0.0	0.0	0.0	64.1	4.2	1.1
North Branch Potomac Basin	**18.9**	**6.5**	**8.8**	**2.8**	**11.7**	**5.8**	**29.1**	**8.3**	**68.6**	**2.2**	**0.4**
Youghiogheny River - 1995	28.4	15.9	30.2	16.1	5.0	2.8	19.9	15.4	83.5	3.2	0.9
Youghiogheny River - 1997	19.8	9.3	20.3	6.0	3.0	3.0	18.4	10.8	61.5	3.2	0.7
Deep Creek Lake - 1995	0.0	0.0	0.0	0.0	0.0	0.0	16.1	4.9	16.1	1.3	0.4
Casselman River - 1995	40.9	21.5	36.4	18.7	22.7	18.7	0.0	0.0	100.0	3.8	0.4
Casselman River - 1997	8.4	7.0	36.3	20.2	3.9	4.3	0.0	0.0	48.6	3.7	0.4
Youghiogheny Basin 1995	**26.7**	**10.6**	**23.9**	**9.3**	**17.2**	**8.9**	**12.4**	**6.9**	**80.1**	**3.3**	**0.6**
Youghiogheny Basin 1997	**20.4**	**8.3**	**23.6**	**4.9**	**2.4**	**1.8**	**20.1**	**9.3**	**66.5**	**2.7**	**0.5**

Table B-2. Estimated percentage of stream miles in each benthic IBI category and mean benthic IBI for the 80 8-digit watersheds with four or more 1995-1997 MBSS sites

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error	Percent Rated	Mean Benthic IBI	Std. Error
Deer Creek	16.9	13.4	80.1	17.3	2.9	2.1	0.0	0.0	100.0	3.7	0.5
Octoraro Creek	0.0	0.0	92.8	54.3	7.2	8.1	0.0	0.0	100.0	3.6	2.0
Conowingo Dam Susquehanna River	0.0	0.0	75.0	24.3	25.0	24.3	0.0	0.0	100.0	3.0	0.2
Broad Creek	5.2	5.2	94.8	6.3	0.0	0.0	0.0	0.0	100.0	3.6	0.2
Susquehanna Basin	**14.9**	**7.9**	**70.0**	**11.7**	**15.0**	**7.8**	**0.0**	**0.0**	**100.0**	**3.5**	**0.3**
Upper Pocomoke River	0.9	0.9	10.6	3.3	22.1	15.7	65.5	22.3	99.1	1.9	0.4
Pocomoke Basin	**0.3**	**0.3**	**11.5**	**7.4**	**18.5**	**10.1**	**69.2**	**14.5**	**99.7**	**1.8**	**0.3**
Lower Wicomico River	0.0	0.0	0.0	0.0	57.0	45.2	43.0	43.0	100.0	2.2	1.2
Nanticoke River	19.9	21.2	53.4	34.7	26.7	26.7	0.0	0.0	100.0	3.2	1.4
Marshyhope Creek	21.5	14.4	26.2	26.2	26.2	26.2	26.2	26.2	100.0	3.0	1.1
Nanticoke/Wicomico Basin	**12.3**	**8.6**	**27.7**	**13.8**	**26.4**	**13.8**	**33.5**	**15.4**	**100.0**	**2.7**	**0.6**
Lower Choptank - 1997	0.0	0.0	25.0	25.0	50.0	28.8	25.0	25.0	100.0	2.2	0.4
Upper Choptank - 1996	5.9	6.0	0.0	0.0	33.3	18.6	60.8	20.3	100.0	2.1	0.3
Upper Choptank - 1997	0.0	0.0	20.1	12.0	25.4	15.2	54.5	19.0	100.0	2.0	0.4
Tuckahoe Creek - 1996	0.0	0.0	47.9	33.4	5.7	4.0	46.4	33.2	100.0	2.7	1.1
Tuckahoe Creek - 1997	0.0	0.0	42.4	37.6	10.1	6.7	47.5	37.8	100.0	2.7	0.8
Choptank Basin 1996	**10.6**	**8.5**	**13.1**	**8.5**	**28.4**	**12.9**	**47.9**	**14.8**	**100.0**	**2.4**	**0.4**
Choptank Basin 1997	**0.0**	**0.0**	**22.7**	**10.6**	**32.8**	**13.2**	**44.5**	**14.2**	**100.0**	**2.1**	**0.3**
Wye River	0.0	0.0	50.0	30.5	50.0	30.5	0.0	0.0	100.0	3.1	0.9
Corsica River	0.0	0.0	70.9	34.3	29.1	29.8	0.0	0.0	100.0	3.0	1.2
Southeast Creek	0.0	0.0	6.8	6.7	79.6	8.3	13.6	8.3	100.0	2.4	0.1
Upper Chester River	34.2	14.8	17.7	8.8	12.0	12.0	36.1	17.4	100.0	2.9	0.5
Chester Basin	**9.9**	**5.6**	**26.5**	**9.0**	**28.5**	**10.5**	**35.2**	**11.3**	**100.0**	**2.6**	**0.4**
Big Elk Creek	0.0	0.0	75.1	24.7	24.9	24.7	0.0	0.0	100.0	3.4	0.3
Northeast River	0.0	0.0	13.0	8.5	87.0	11.3	0.0	0.0	100.0	2.4	0.3
Elk Basin	**0.0**	**0.0**	**33.0**	**14.8**	**46.0**	**17.3**	**21.0**	**14.3**	**100.0**	**2.6**	**0.5**
Atkisson Reservoir	0.0	0.0	39.2	19.8	21.0	4.1	19.9	20.0	80.1	2.6	0.8
Bynum Run	0.0	0.0	0.0	0.0	37.9	21.6	62.1	21.6	100.0	1.9	0.3
Bush Basin	**0.0**	**0.0**	**16.5**	**10.6**	**27.5**	**11.8**	**45.8**	**16.3**	**89.8**	**2.1**	**0.4**
Little Gunpowder Falls	0.0	0.0	86.5	13.4	13.4	13.4	0.0	0.0	100.0	3.3	0.1
Loch Raven Reservoir	32.2	12.3	60.0	13.0	7.8	6.9	0.0	0.0	100.0	3.7	0.4
Prettyboy Reservoir	0.0	0.0	62.6	37.4	0.0	0.0	37.4	37.4	100.0	2.6	0.5
Gunpowder Basin	**18.7**	**7.6**	**62.5**	**9.8**	**14.8**	**6.8**	**4.0**	**4.0**	**100.0**	**3.4**	**0.3**

Table B-2. (Continued)

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error	Percent Rated	Mean Benthic IBI	Std. Error
Back River - 1995	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	1.4	0.4
Back River - 1996	0.0	0.0	0.0	0.0	0.0	0.0	100.0	26.1	100.0	1.2	0.4
Baltimore Harbor - 1995	0.0	0.0	8.1	8.1	13.4	8.1	78.5	0.0	100.0	1.8	0.1
Baltimore Harbor - 1996	0.0	0.0	30.2	30.1	9.4	9.4	60.4	30.1	100.0	2.0	0.7
Jones Falls - 1995	0.0	0.0	0.0	0.0	92.1	39.0	7.9	8.4	100.0	3.3	1.3
Jones Falls - 1996	0.0	0.0	15.0	0.0	36.1	36.1	48.8	36.1	100.0	1.8	0.4
Gwynns Falls - 1995	0.0	0.0	42.5	0.0	0.0	0.0	57.5	0.0	100.0	2.3	0.1
Gwynns Falls - 1996	0.0	0.0	2.8	2.8	31.5	20.6	65.6	20.5	100.0	1.9	0.2
Patapsco River Lower North Branch - 1995	3.4	3.4	30.4	18.8	38.1	21.0	28.4	18.8	100.0	2.7	0.3
Liberty Reservoir - 1995	17.1	9.7	70.8	14.3	12.0	6.2	0.0	0.0	100.0	3.5	0.5
Liberty Reservoir - 1996	2.7	1.8	42.5	20.5	34.9	17.3	19.9	16.6	100.0	2.7	0.5
South Branch Patapsco - 1995	36.3	32.8	19.9	11.2	43.9	34.6	0.0	0.0	100.0	3.4	0.5
South Branch Patapsco - 1996	10.9	10.9	43.9	15.2	30.8	14.5	8.6	4.7	100.0	3.0	0.2
Patapsco Basin 1995	**13.7**	**5.9**	**53.3**	**9.2**	**16.7**	**6.1**	**16.2**	**5.5**	**100.0**	**2.1**	**0.3**
Patapsco Basin 1996	**4.2**	**3.3**	**27.0**	**7.4**	**26.0**	**4.0**	**41.5**	**8.2**	**98.7**	**2.3**	**0.2**
Severn River	3.0	3.1	12.1	6.6	58.8	41.0	26.1	15.9	100.0	2.5	1.0
South River	0.0	0.0	0.0	0.0	41.5	31.7	58.4	35.8	100.0	1.9	0.7
West Chesapeake Bay	0.0	0.0	5.6	4.7	16.9	8.4	77.8	33.8	100.0	1.7	0.5
West Chesapeake Basin	**0.5**	**0.5**	**3.9**	**1.8**	**25.8**	**10.2**	**69.8**	**16.8**	**100.0**	**1.8**	**0.3**
Patuxent River (Lower)	2.5	2.5	43.5	13.3	28.4	13.1	25.6	12.8	100.0	2.6	0.2
Patuxent River (Middle)	8.8	8.8	31.7	21.7	39.7	22.9	19.8	19.8	100.0	2.6	0.3
Western Branch	0.0	0.0	6.6	5.3	72.9	23.8	20.5	18.9	100.0	2.1	0.4
Patuxent River (Upper)	0.0	0.0	0.0	0.0	60.0	24.5	40.0	24.5	100.0	2.3	0.2
Little Patuxent River	0.0	0.0	14.0	14.0	42.0	18.1	44.0	18.1	100.0	2.1	0.3
Middle Patuxent River	45.7	38.0	54.3	38.0	0.0	0.0	0.0	0.0	100.0	4.0	1.5
Rocky Gorge Dam	44.3	37.8	55.7	37.8	0.0	0.0	0.0	0.0	100.0	3.9	0.2
Brighton Dam	13.7	5.2	69.2	17.8	17.1	17.1	0.0	0.0	100.0	3.5	0.2
Patuxent Basin	**8.8**	**3.4**	**33.1**	**6.4**	**35.5**	**6.9**	**22.6**	**6.0**	**100.0**	**2.7**	**0.2**
St. Clement Bay	17.1	17.0	48.8	20.8	34.1	20.8	0.0	0.0	100.0	3.5	0.3
Gilbert Swamp	0.0	0.0	66.7	0.0	0.0	0.0	33.3	0.0	100.0	3.2	0.0
Zekiah Swamp	23.8	11.3	32.3	14.1	22.9	13.6	20.9	13.5	100.0	3.1	0.3
Nanjemoy Creek	17.2	12.9	31.0	19.0	34.5	22.0	17.3	17.3	100.0	2.9	0.8
Mattawoman Creek	17.4	17.2	17.4	17.2	47.9	24.9	17.4	17.2	100.0	2.9	0.6
Lower Potomac Basin	**16.3**	**5.6**	**40.0**	**9.3**	**29.7**	**8.8**	**13.0**	**6.3**	**99.0**	**3.2**	**0.3**

Table B-2. (Continued)

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error	Percent Rated	Mean Benthic IBI	Std. Error
Potomac River (Upper-tidal)	0.0	0.0	0.0	0.0	20.5	20.3	79.5	20.3	100.0	1.7	0.2
Potomac River (Montgomery County)	15.0	15.0	41.6	18.6	28.5	15.3	15.0	15.0	100.0	3.1	0.3
Piscataway Creek	18.2	0.0	2.9	2.9	78.9	2.9	0.0	0.0	100.0	2.7	0.2
Anacostia River	2.3	2.3	8.9	5.1	23.2	20.3	65.7	23.7	100.0	2.0	0.5
Rock Creek	0.0	0.0	13.1	6.4	31.0	22.8	55.9	27.3	100.0	2.1	0.6
Cabin John Creek	0.0	0.0	0.0	0.0	7.8	7.7	92.2	7.7	100.0	1.7	0.1
Potomac Washington Metro Basin	**7.8**	**4.3**	**26.6**	**6.7**	**29.3**	**7.4**	**36.3**	**7.9**	**100.0**	**2.6**	**0.2**
Seneca Creek	10.4	8.9	51.2	13.0	20.8	11.6	17.5	11.4	100.0	3.0	0.2
Potomac River (Frederick County)	0.0	0.0	0.0	0.0	25.2	8.3	74.8	8.3	100.0	1.8	0.1
Lower Monocacy River	0.0	0.0	45.0	14.4	25.0	9.2	29.0	13.2	99.0	2.6	0.4
Upper Monocacy River	0.0	0.0	19.1	8.9	36.4	8.7	44.6	12.0	100.0	2.1	0.3
Double Pipe Creek	0.0	0.0	16.6	9.3	45.0	13.9	38.4	13.5	100.0	2.1	0.2
Catoctin Creek	0.0	0.0	54.9	34.9	27.4	27.5	17.7	18.8	100.0	2.7	1.1
Middle Potomac Basin	**0.0**	**0.0**	**27.8**	**6.0**	**33.7**	**5.7**	**37.9**	**6.7**	**99.3**	**2.3**	**0.2**
Potomac River (Washington County)	0.0	0.0	21.0	21.0	58.0	24.0	21.0	21.0	100.0	2.5	0.4
Antietam Creek	21.8	17.0	34.6	17.3	24.4	17.1	16.7	16.7	97.5	3.0	0.6
Conococheague	11.8	11.7	88.2	11.7	0.0	0.0	0.0	0.0	100.0	3.5	0.1
Sideling Hill Creek	0.0	0.0	43.3	37.1	50.0	37.2	6.7	7.0	100.0	2.7	1.1
Fifteen Mile Creek	22.0	12.3	45.1	15.1	34.0	15.2	0.0	0.0	100.0	3.2	0.2
Town Creek	0.0	0.0	89.0	7.1	5.5	5.5	5.5	5.5	100.0	3.3	0.2
Upper Potomac Basin	**16.0**	**5.3**	**41.9**	**7.7**	**30.3**	**7.3**	**11.0**	**5.1**	**99.2**	**3.0**	**0.2**
Potomac River (Lower North Branch)	5.2	3.0	73.8	14.2	18.6	14.1	2.3	2.3	100.0	3.4	0.1
Wills Creek	0.0	0.0	67.3	5.4	0.0	0.0	32.7	5.4	100.0	3.0	0.2
Georges Creek	0.0	0.0	0.0	0.0	31.5	26.5	68.5	26.7	100.0	2.0	0.2
Potomac River (Upper North Branch)	7.1	7.0	35.8	35.8	50.1	36.5	7.1	7.0	100.0	3.2	0.4
Savage River	19.6	12.4	77.3	17.7	3.1	3.1	0.0	0.0	100.0	3.7	0.6
North Branch Potomac Basin	**7.7**	**3.9**	**60.2**	**9.1**	**17.8**	**6.3**	**13.6**	**5.4**	**99.4**	**3.2**	**0.3**
Youghiogheny River - 1995	41.5	15.2	51.0	16.2	5.0	3.1	2.5	1.7	100.0	3.7	0.5
Youghiogheny River - 1997	28.7	10.9	55.6	13.8	14.3	9.7	0.0	0.0	98.6	3.6	0.5
Deep Creek Lake - 1995	0.0	0.0	93.9	4.9	0.0	0.0	6.1	0.0	100.0	1.1	0.9
Casselman River - 1995	58.1	18.5	38.4	19.5	3.4	3.4	0.0	0.0	100.0	4.0	0.3
Casselman River - 1997	0.0	0.0	91.6	54.9	8.4	7.0	0.0	0.0	100.0	3.3	1.7
Youghiogheny Basin 1995	**44.1**	**11.1**	**50.8**	**11.3**	**3.2**	**1.7**	**1.9**	**1.0**	**100.0**	**3.8**	**0.3**
Youghiogheny Basin 1997	**24.2**	**9.0**	**54.7**	**11.3**	**14.2**	**7.5**	**6.1**	**5.3**	**99.2**	**3.4**	**0.4**

Table B-3. Estimated percentage of stream miles in each Physical Habitat Index (PHI) category for the 80 8-digit watersheds with four or more 1995-1997 MBSS sites

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error
Deer Creek	25.3	13.7	48.2	19.0	13.3	13.2	13.3	13.2
Octoraro Creek	23.1	21.3	76.9	57.8	0.0	0.0	0.0	0.0
Conowingo Dam Susquehanna River	75.0	24.4	25.0	24.4	0.0	0.0	0.0	0.0
Broad Creek	15.3	10.9	38.5	38.7	46.2	39.2	0.0	0.0
Susquehanna Basin	**23.2**	**6.9**	**52.2**	**12.6**	**18.7**	**9.6**	**5.9**	**5.9**
Upper Pocomoke River	4.3	2.2	28.0	19.1	30.1	19.1	37.6	24.4
Pocomoke Basin	**1.8**	**0.9**	**43.3**	**17.3**	**35.5**	**15.7**	**19.4**	**13.2**
Lower Wicomico River	0.0	0.0	0.0	0.0	14.1	15.8	85.9	53.0
Nanticoke River	19.9	21.2	26.7	26.7	26.7	26.7	26.7	26.7
Marshyhope Creek	21.5	14.4	26.2	26.2	26.2	26.2	26.2	26.2
Nanticoke/Wicomico Basin	**6.5**	**2.9**	**16.8**	**11.5**	**26.4**	**13.8**	**50.3**	**17.7**
Lower Choptank - 1997	33.3	33.3	0.0	0.0	33.3	33.3	33.3	33.3
Upper Choptank - 1996	35.2	20.7	18.9	18.9	45.9	25.7	0.0	0.0
Upper Choptank - 1997	42.3	22.8	0.0	0.0	8.6	6.0	49.1	25.1
Tuckahoe Creek - 1996	67.5	33.1	32.5	32.9	0.0	0.0	0.0	0.0
Tuckahoe Creek - 1997	37.4	37.2	52.5	38.0	10.1	6.7	0.0	0.0
Choptank Basin 1996	**54.0**	**17.2**	**21.4**	**14.4**	**24.7**	**14.8**	**0.0**	**0.0**
Choptank Basin 1997	**36.8**	**16.8**	**4.9**	**2.9**	**16.9**	**10.9**	**41.4**	**18.2**
Wye River	0.0	0.0	0.0	0.0	25.0	24.9	75.0	30.5
Corsica River	16.6	17.4	54.3	33.6	29.1	29.8	0.0	0.0
Southeast Creek	0.0	0.0	40.0	24.3	60.0	24.3	0.0	0.0
Upper Chester River	19.0	10.3	24.2	10.7	15.2	14.0	41.6	20.6
Chester Basin	**6.1**	**2.7**	**26.1**	**8.9**	**28.3**	**10.9**	**39.4**	**13.0**
Big Elk Creek	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northeast River	30.1	11.3	69.9	8.5	0.0	0.0	0.0	0.0
Elk Basin	**55.5**	**17.4**	**33.9**	**16.8**	**10.5**	**10.5**	**0.0**	**0.0**
Atkisson Reservoir	30.7	11.4	29.6	22.0	0.0	0.0	39.7	23.5
Bynum Run	56.8	18.7	18.9	18.7	0.0	0.0	24.2	0.0
Bush Basin	**35.0**	**12.4**	**29.4**	**14.8**	**10.6**	**10.6**	**25.0**	**14.6**
Little Gunpowder Falls	66.3	16.5	20.2	13.4	0.0	0.0	13.5	13.4
Loch Raven Reservoir	30.8	10.5	31.0	11.7	24.4	11.3	13.8	9.3
Prettyboy Reservoir	7.2	1.8	47.3	38.3	8.1	8.1	37.4	37.4
Gunpowder Basin	**33.2**	**8.5**	**31.3**	**8.5**	**19.5**	**7.7**	**15.9**	**7.4**
Back River - 1995	25.0	24.9	50.0	28.7	25.0	24.9	0.0	0.0
Back River - 1996	42.1	28.1	23.7	12.2	7.9	8.1	26.3	26.9
Baltimore Harbor - 1995	5.2	0.0	16.3	0.0	78.5	0.0	0.0	0.0
Baltimore Harbor - 1996	9.4	9.3	0.0	0.0	60.4	30.1	30.2	30.1

Table B-3. (Continued)

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error
Jones Falls - 1995	7.9	8.4	54.0	38.9	0.0	0.0	38.1	38.3
Jones Falls - 1996	15.0	0.0	48.8	36.1	0.0	0.0	36.1	36.1
Patapsco River Lower North Branch - 1995	11.9	4.8	48.3	21.5	39.8	21.2	0.0	0.0
Liberty Reservoir - 1995	54.0	21.3	24.2	17.4	5.2	4.1	16.7	16.7
Liberty Reservoir - 1996	44.9	12.6	39.3	13.2	15.7	8.7	0.0	0.0
South Branch Patapsco - 1995	46.0	15.1	31.4	15.0	22.5	14.2	0.0	0.0
South Branch Patapsco - 1996	27.4	2.4	5.3	2.4	65.5	0.0	1.8	1.7
Patapsco Basin 1995	**29.0**	**6.6**	**41.0**	**8.7**	**25.0**	**7.8**	**4.0**	**3.4**
Patapsco Basin 1996	**34.6**	**7.2**	**23.3**	**6.6**	**18.8**	**6.8**	**23.3**	**7.5**
Severn River	34.2	16.6	19.1	12.9	46.7	42.6	0.0	0.0
South River	0.0	0.0	50.0	49.8	0.0	0.0	50.0	49.8
West Chesapeake Bay	4.2	4.4	5.6	4.7	65.8	31.5	24.4	25.6
West Chesapeake Basin	**9.2**	**3.2**	**13.1**	**8.1**	**38.8**	**14.7**	**38.9**	**15.7**
Patuxent River (Lower)	7.9	3.7	19.9	10.2	63.1	11.9	9.0	9.0
Patuxent River (Middle)	8.8	8.8	88.1	8.8	3.1	0.0	0.0	0.0
Western Branch	5.1	1.9	28.6	19.7	47.4	23.8	18.8	18.8
Patuxent River (Upper)	0.0	0.0	60.0	24.5	20.0	20.0	20.0	20.0
Little Patuxent River	21.9	14.7	16.1	5.7	29.9	17.2	32.0	17.6
Middle Patuxent River	91.3	38.1	0.0	0.0	8.7	9.2	0.0	0.0
Rocky Gorge Dam	21.1	0.0	37.2	37.2	41.6	37.2	0.0	0.0
Brighton Dam	18.0	5.2	61.3	17.7	20.7	17.4	0.0	0.0
Patuxent Basin	**16.8**	**4.2**	**36.8**	**6.9**	**34.6**	**6.9**	**11.8**	**4.8**
St. Clement Bay	48.8	20.8	0.0	0.0	34.1	20.8	17.1	17.0
Gilbert Swamp	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Zekiah Swamp	12.5	5.1	46.3	17.6	29.2	15.9	12.0	12.0
Nanjemoy Creek	17.2	12.9	31.0	19.0	34.5	22.0	17.3	17.3
Mattawoman Creek	36.9	26.2	42.1	25.6	0.0	0.0	21.0	20.9
Lower Potomac Basin	**24.1**	**7.1**	**22.2**	**7.7**	**36.9**	**9.8**	**16.8**	**7.5**
Potomac River (Upper-tidal)	61.6	0.0	0.0	0.0	38.4	0.0	0.0	0.0
Potomac River (Montgomery County)	0.0	0.0	25.9	16.0	70.8	16.0	3.4	3.4
Piscataway Creek	38.8	23.7	0.0	0.0	61.2	65.6	0.0	0.0
Anacostia River	12.4	5.5	25.5	7.6	22.2	20.2	39.9	23.6
Rock Creek	4.4	4.5	73.4	27.6	22.2	22.4	0.0	0.0
Cabin John Creek	7.8	7.7	46.1	39.0	7.8	7.7	38.3	38.2
Potomac Washington Metro Basin	**7.3**	**1.9**	**39.4**	**7.7**	**43.0**	**8.5**	**10.3**	**5.3**
Seneca Creek	0.0	0.0	49.5	13.9	50.5	13.9	0.0	0.0
Potomac River (Frederick County)	0.0	0.0	10.3	0.0	48.5	34.9	41.2	34.6
Lower Monocacy River	16.7	4.1	32.2	13.3	41.2	14.4	9.9	8.5

Table B-3. (Continued)

Watershed	Good	Std. Error	Fair	Std. Error	Poor	Std. Error	Very Poor	Std. Error
Upper Monocacy River	23.3	6.3	29.4	8.5	21.4	9.8	25.8	10.8
Double Pipe Creek	16.3	3.7	26.3	12.1	3.2	2.4	54.2	11.7
Catoctin Creek	0.0	0.0	0.0	0.0	33.3	33.3	66.7	42.1
Middle Potomac Basin	**17.5**	**2.6**	**24.4**	**5.4**	**25.9**	**6.0**	**32.3**	**6.8**
Potomac River (Washington County)	0.0	0.0	0.0	0.0	26.6	26.6	73.4	30.7
Antietam Creek	20.4	5.4	19.3	16.9	24.4	17.1	36.0	20.7
Conococheague	0.0	0.0	23.5	11.7	76.5	11.7	0.0	0.0
Sideling Hill Creek	6.7	7.0	43.3	37.1	50.0	37.2	0.0	0.0
Fifteen Mile Creek	3.3	2.2	3.3	2.2	28.5	18.3	64.9	22.6
Town Creek	3.9	3.9	9.4	6.7	37.8	37.8	48.8	38.2
Upper Potomac Basin	**8.4**	**2.4**	**18.5**	**6.1**	**28.1**	**7.7**	**44.9**	**8.8**
Potomac River (Lower North Branch)	0.0	0.0	37.1	25.5	54.6	25.5	8.3	6.0
Wills Creek	5.5	5.4	5.5	5.4	21.7	0.0	67.3	5.4
Georges Creek	5.6	5.5	5.6	5.5	63.0	26.7	25.9	25.9
Potomac River (Upper North Branch)	1.8	1.8	15.9	7.3	3.6	2.0	78.7	7.0
Savage River	14.4	6.0	37.7	13.6	35.9	17.3	12.0	12.0
North Branch Potomac Basin	**7.4**	**2.7**	**27.1**	**6.8**	**36.2**	**9.3**	**29.3**	**9.2**
Youghiogheny River - 1995	15.2	6.7	23.3	15.6	39.8	19.8	21.7	15.6
Youghiogheny River - 1997	4.6	3.5	21.7	6.5	39.9	14.0	33.8	13.6
Deep Creek Lake - 1995	0.0	0.0	0.0	0.0	6.1	0.0	93.9	4.9
Casselman River - 1995	46.7	21.3	3.4	3.4	49.8	21.8	0.0	0.0
Casselman River - 1997	8.0	7.0	32.2	18.2	55.6	56.4	4.2	4.7
Youghiogheny Basin - 1995	**21.6**	**9.1**	**10.9**	**6.8**	**35.9**	**11.6**	**31.6**	**11.5**
Youghigheny Basin - 1997	**4.8**	**2.5**	**26.7**	**7.2**	**35.6**	**11.3**	**32.8**	**11.2**

Table B-4. Percentage of stream miles that are channelized for the 80 8-digit watersheds with four or more 1995-1997 MBSS sites

Watershed	Percent Channelized	Standard Error
Deer Creek	14.3	13.3
Octoraro Creek	0.0	0.0
Conowingo Dam Susquehanna River	0.0	0.0
Broad Creek	0.0	0.0
Susquehanna Basin	**7.1**	**6.4**
Upper Pocomoke River	96.8	26.8
Pocomoke Basin	**80.8**	**11.9**
Lower Wicomico River	57.0	45.2
Nanticoke River	46.6	33.6
Marshyhope Creek	78.5	35.8
Nanticoke/Wicomico Basin	**51.8**	**13.9**
Lower Choptank - 1997	0.0	0.0
Upper Choptank - 1996	45.9	25.7
Upper Choptank - 1997	49.1	25.1
Tuckahoe Creek - 1996	21.1	10.1
Tuckahoe Creek - 1997	62.6	38.3
Choptank Basin 1996	**33.6**	**15.2**
Choptank Basin 1997	**38.2**	**15.1**
Wye River	0.0	0.0
Corsica River	29.1	29.8
Southeast Creek	60.0	24.3
Upper Chester River	43.0	20.6
Chester Basin	**43.8**	**11.1**
Big Elk Creek	0.0	0.0
Northeast River	61.4	0.0
Elk Basin	**22.0**	**14.2**
Atkisson Reservoir	0.0	0.0
Bynum Run	37.9	21.6
Bush Basin	**3.2**	**2.1**
Little Gunpowder Falls	0.0	0.0
Loch Raven Reservoir	13.5	7.9
Prettyboy Reservoir	0.0	0.0
Gunpowder Basin	**7.3**	**4.5**
Back River	75.0	24.9
Back River	84.2	28.3
Baltimore Harbor	0.0	0.0
Baltimore Harbor	30.2	30.2
Jones Falls	0.0	0.0
Jones Falls	48.9	36.1
Gwynns Falls	0.0	0.0
Gwynns Falls	57.4	20.5
Patapsco River Lower North Branch	23.3	18.6
Liberty Reservoir	9.6	6.3
Liberty Reservoir	18.1	16.8
South Branch Patapsco	0.0	0.0
South Branch Patapsco	25.4	14.5
Patapsco Basin 1995	**9.9**	**4.3**
Patapsco Basin 1996	**38.2**	**7.9**
Severn River	0.0	0.0
South River	0.0	0.0
West Chesapeake Bay	0.0	0.0
West Chesapeake Basin	**0.0**	**0.0**

Table B-4. (Continued)

Watershed	Percent Channelized	Standard Error
Patuxent River (Lower)	0.0	0.0
Patuxent River (Middle)	0.0	0.0
Western Branch	0.0	0.0
Patuxent River (Upper)	20.0	20.0
Little Patuxent River	18.0	14.5
Middle Patuxent River	0.0	0.0
Rocky Gorge Dam	0.0	0.0
Brighton Dam	0.0	0.0
Patuxent Basin	**5.0**	**3.1**
St. Clement Bay	0.0	0.0
Gilbert Swamp	100.0	0.0
Zekiah Swamp	10.2	4.8
Nanjemoy Creek	0.0	0.0
Mattawoman Creek	0.0	0.0
Lower Potomac Basin	**6.3**	**1.9**
Potomac River (Upper-tidal)	20.5	20.3
Potomac River (Montgomery County)	29.9	18.3
Piscataway Creek	0.0	0.0
Anacostia River	47.8	20.9
Rock Creek	0.0	0.0
Cabin John Creek	15.6	7.7
Potomac Washington Metro Basin	**25.0**	**6.8**
Seneca Creek	22.5	11.7
Potomac River (Frederick County)	14.6	8.4
Lower Monocacy River	13.3	8.7
Upper Monocacy River	5.7	3.7
Double Pipe Creek	8.9	8.9
Catoctin Creek	0.0	0.0
Middle Potomac Basin	**8.6**	**3.5**
Potomac River (Washington County)	26.6	26.6
Antietam Creek	68.0	20.9
Conococheague	0.0	0.0
Sideling Hill Creek	13.4	9.0
Fifteen Mile Creek	0.0	0.0
Town Creek	0.0	0.0
Upper Potomac Basin	**23.5**	**7.4**
Potomac River (Lower North Branch)	8.3	6.0
Wills Creek	10.9	5.4
Georges Creek	22.3	5.5
Potomac River (Upper North Branch)	8.9	7.3
Savage River	14.5	12.2
North Branch Potomac Basin	**13.0**	**5.2**
Youghiogheny River - 1995	5.1	3.9
Youghiogheny River - 1997	6.1	4.1
Deep Creek Lake - 1995	0.0	0.0
Casselman River - 1995	0.0	0.0
Casselman River - 1997	4.2	4.7
Youghiogheny Basin 1995	**2.6**	**1.9**
Youghiogheny Basin 1997	**4.1**	**2.2**

Table B-5. Estimated percentage of stream miles in each bank stability category for the 80 8-digit watersheds with four or more 1995-997 MBSS sites

Watershed	Optimal	Std. Error	Sub-optimal	Std. Error	Marginal	Std. Error	Poor	Std. Error
Deer Creek	18.8	13.5	48.9	19.0	31.2	17.3	1.1	1.1
Octoraro Creek	0.0	0.0	69.7	58.3	14.4	7.8	15.9	17.9
Conowingo Dam Susquehanna River	50.0	28.1	50.0	28.1	0.0	0.0	0.0	0.0
Broad Creek	0.0	0.0	38.5	38.7	61.5	39.8	0.0	0.0
Susquehanna Basin	**24.4**	**10.1**	**40.8**	**11.5**	**26.4**	**10.1**	**8.4**	**6.5**
Upper Pocomoke River	7.0	3.6	65.7	26.8	6.3	3.2	20.9	18.8
Pocomoke Basin	**26.4**	**12.2**	**51.1**	**14.5**	**12.7**	**9.2**	**9.8**	**9.0**
Lower Wicomico River	0.0	0.0	14.1	15.8	85.9	53.0	0.0	0.0
Nanticoke River	26.7	26.7	53.4	34.7	19.9	21.2	0.0	0.0
Marshyhope Creek	10.8	11.3	63.1	34.7	26.2	26.2	0.0	0.0
Nanticoke/Wicomico Basin	**12.2**	**8.4**	**53.9**	**14.0**	**33.8**	**13.4**	**0.0**	**0.0**
Lower Choptank - 1997	66.7	38.4	0.0	0.0	0.0	0.0	33.3	33.3
Upper Choptank - 1996	18.9	18.9	54.1	25.7	27.0	20.5	0.0	0.0
Upper Choptank - 1997	32.7	21.9	58.7	25.8	4.3	4.4	4.3	4.4
Tuckahoe Creek - 1996	32.5	32.9	54.9	33.4	12.6	8.8	0.0	0.0
Tuckahoe Creek - 1997	15.2	7.7	47.5	37.8	0.0	0.0	37.4	37.2
Choptank Basin 1996	**34.8**	**16.4**	**46.9**	**16.7**	**18.3**	**12.0**	**0.0**	**0.0**
Choptank Basin 1997	**43.7**	**15.4**	**38.6**	**15.2**	**2.5**	**2.5**	**15.2**	**10.6**
Wye River	0.0	0.0	25.0	24.9	50.0	30.5	25.0	24.9
Corsica River	29.1	29.8	16.6	17.4	50.0	33.6	4.3	4.4
Southeast Creek	0.0	0.0	0.0	0.0	20.0	19.8	80.0	19.8
Upper Chester River	18.1	57.4	20.3	10.7	9.6	13.9	19.3	24.7
Chester Basin	**19.8**	**9.2**	**32.2**	**10.4**	**28.9**	**10.3**	**19.1**	**8.4**
Big Elk Creek	0.0	0.0	75.1	24.7	24.9	24.7	0.0	0.0
Northeast River	17.0	10.7	74.5	8.5	0.0	0.0	8.5	8.5
Elk Basin	**32.1**	**14.6**	**42.0**	**15.9**	**23.3**	**14.9**	**2.5**	**2.5**
Atkisson Reservoir	19.9	20.0	40.9	19.9	39.2	19.8	0.0	0.0
Bynum Run	18.9	18.7	18.9	18.7	18.9	18.7	43.2	18.7
Bush Basin	**14.9**	**11.9**	**30.0**	**15.4**	**46.7**	**16.4**	**8.3**	**4.4**
Little Gunpowder Falls	0.0	0.0	19.7	12.9	53.3	20.9	26.9	16.5
Loch Raven Reservoir	0.9	0.9	23.0	8.4	52.6	13.6	23.5	11.3
Prettyboy Reservoir	3.6	2.2	41.0	37.5	9.9	8.3	45.5	38.3
Gunpowder Basin	**2.0**	**1.0**	**19.0**	**6.3**	**54.0**	**9.4**	**28.0**	**8.7**
Back River - 1995	25.0	24.9	0.0	0.0	75.0	24.9	0.0	0.0
Back River - 1996	7.9	8.1	15.8	10.8	42.1	28.1	34.2	27.6
Baltimore Harbor - 1995	0.0	0.0	8.1	8.1	83.7	0.0	8.1	8.1
Baltimore Harbor - 1996	39.6	31.6	0.0	0.0	30.2	30.1	30.2	30.1

Table B-5. (Continued)

Watershed	Optimal	Std. Error	Sub-optimal	Std. Error	Marginal	Std. Error	Poor	Std. Error
Jones Falls - 1995	0.0	0.0	0.0	0.0	61.9	38.3	38.1	38.3
Jones Falls - 1996	36.1	36.1	20.2	7.5	43.6	36.8	0.0	0.0
Patapsco River Lower North Branch - 1995	38.1	21.0	6.8	4.3	31.8	18.8	23.3	18.6
Liberty Reservoir - 1995	0.0	0.0	20.5	9.2	60.9	13.5	18.6	10.1
Liberty Reservoir - 1996	1.4	1.4	28.4	17.5	49.8	21.2	20.4	17.1
South Branch Patapsco - 1995	3.5	2.2	11.1	11.1	7.0	2.4	78.4	11.2
South Branch Patapsco - 1996	36.7	15.3	34.3	15.1	11.8	5.2	17.9	12.0
Patapsco Basin 1995	**10.0**	**5.4**	**11.9**	**4.4**	**33.8**	**13.4**	**30.5**	**8.2**
Patapsco Basin 1996	**20.0**	**6.7**	**19.8**	**5.8**	**39.8**	**7.8**	**20.5**	**6.7**
Severn River	0.0	0.0	25.1	14.4	25.1	14.4	49.7	42.2
South River	50.0	49.8	0.0	0.0	0.0	0.0	50.0	49.8
West Chesapeake Bay	61.5	31.5	24.4	24.6	8.4	6.1	5.6	4.7
West Chesapeake Basin	**38.0**	**13.5**	**19.7**	**11.0**	**22.4**	**11.1**	**19.8**	**11.1**
Patuxent River (Lower)	18.0	11.9	17.9.8	9.8	56.0	15.0	9.0	9.0
Patuxent River (Middle)	0.0	0.0	0.0	0.0	60.3	22.9	39.7	22.9
Western Branch	0.0	0.0	18.8	18.8	25.4	19.5	55.8	23.9
Patuxent River (Upper)	20.0	20.0	0.0	0.0	40.0	24.5	40.0	24.5
Little Patuxent River	4.0	4.0	8.1	5.2	83.9	5.2	4.0	4.0
Middle Patuxent River	0.0	0.0	82.7	38.5	17.3	10.7	0.0	0.0
Rocky Gorge Dam	0.0	0.0	0.0	0.0	85.9	7.0	14.1	7.0
Brighton Dam	0.0	0.0	17.1	17.1	75.6	17.6	7.3	4.2
Patuxent Basin	**7.2**	**3.7**	**14.7**	**4.8**	**57.1**	**6.7**	**21.0**	**5.5**
St. Clement Bay	0.0	0.0	0.0	0.0	58.5	22.1	41.5	22.1
Gilbert Swamp	0.0	0.0	44.5	22.0	0.0	0.0	55.5	22.0
Zekiah Swamp	20.0	12.7	24.6	13.0	55.5	17.5	0.0	0.0
Nanjemoy Creek	17.3	17.3	24.1	18.5	51.8	25.1	6.9	7.0
Mattawoman Creek	0.0	0.0	42.1	25.6	57.9	30.1	0.0	0.0
Lower Potomac Basin	**10.5**	**5.8**	**15.9**	**5.9**	**57.9**	**9.0**	**15.6**	**6.8**
Potomac River (Upper-tidal)	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Potomac River (Montgomery County)	51.7	18.8	37.4	19.1	6.8	4.1	4.1	4.1
Piscataway Creek	90.5	61.4	9.5	5.8	0.0	0.0	0.0	0.0
Anacostia River	64.4	23.8	5.6	4.1	5.6	4.1	24.5	20.2
Rock Creek	33.7	22.2	26.6	22.7	35.4	22.8	4.4	4.5
Cabin John Creek	53.9	39.0	0.0	0.0	46.1	39.0	0.0	0.0
Potomac Washington Metro Basin	**50.4**	**8.1**	**28.5**	**7.5**	**15.8**	**5.6**	**8.3**	**3.4**
Seneca Creek	46.2	13.9	43.4	14.3	10.4	8.9	0.0	0.0
Potomac River (Frederick County)	67.8	0.0	19.7	8.9	7.3	7.2	5.2	5.1
Lower Monocacy River	25.2	13.1	18.3	8.8	45.1	13.5	15.4	8.9

Table B-5. (Continued)

Watershed	Optimal	Std. Error	Sub-optimal	Std. Error	Marginal	Std. Error	Poor	Std. Error
Upper Monocacy River	37.1	9.7	17.0	8.5	28.0	8.8	17.8	8.9
Double Pipe Creek	0.0	0.0	6.3	6.2	75.0	12.1	18.7	11.7
Catoctin Creek	66.7	42.1	33.3	33.3	0.0	0.0	0.0	0.0
Middle Potomac Basin	**25.7**	**6.1**	**15.5**	**4.7**	**42.9**	**6.5**	**15.9**	**5.0**
Potomac River (Washington County)	26.6	26.6	26.6	26.6	46.8	26.8	0.0	0.0
Antietam Creek	24.4	17.1	7.7	4.1	51.3	20.8	16.7	16.7
Conococheague	0.0	0.0	23.5	11.7	76.5	11.7	0.0	0.0
Sideling Hill Creek	63.4	36.8	36.6	36.8	0.0	0.0	0.0	0.0
Fifteen Mile Creek	60.1	22.9	38.3	18.6	1.7	1.7	0.0	0.0
Town Creek	52.7	38.4	41.8	38.0	0.0	0.0	5.5	5.5
Upper Potomac Basin	**43.5**	**8.4**	**24.2**	**7.0**	**27.9**	**7.8**	**4.4**	**3.7**
Potomac River (Lower North Branch)	58.3	25.6	37.1	25.5	4.6	4.8	0.0	0.0
Wills Creek	67.3	5.4	32.7	5.4	0.0	0.0	0.0	0.0
Georges Creek	74.1	26.5	0.0	0.0	25.9	25.9	0.0	0.0
Potomac River (Upper North Branch)	28.4	0.0	35.8	35.8	0.0	0.0	35.8	35.8
Savage River	93.8	16.1	6.2	4.2	0.0	0.0	0.0	0.0
North Branch Potomac Basin	**73.7**	**5.8**	**16.5**	**6.7**	**5.2**	**4.7**	**4.7**	**4.7**
Youghiogheny River - 1995	55.2	20.3	38.1	19.8	1.7	1.7	5.1	3.9
Youghiogheny River - 1997	92.3	14.5	4.6	3.5	3.0	3.0	0.0	0.0
Deep Creek Lake - 1995	0.0	0.0	11.1	4.9	88.9	4.9	0.0	0.0
Casselman River - 1995	55.6	22.0	22.7	18.7	18.2	18.2	3.4	3.4
Casselman River - 1997	92.0	52.1	3.9	4.3	4.2	4.7	0.0	0.0
Youghiogheny Basin - 1995	**42.9**	**10.6**	**33.2**	**10.4**	**20.4**	**9.4**	**3.4**	**2.1**
Youghiogheny Basin - 1997	**94.2**	**2.5**	**3.0**	**1.8**	**2.7**	**1.9**	**0.0**	**0.0**

Table B-6. Number of dams and other blockages in the 80 8-digit watersheds with four or more 1995-1997 MBSS sites

Watershed	Number of Blockages
Deer Creek	0
Octoraro Creek	0
Conowingo Dam Susquehanna River	0
Broad Creek	0
Susquehanna Basin	**0**
Upper Pocomoke River	1
Pocomoke Basin	**1**
Lower Wicomico River	0
Nanticoke River	0
Marshyhope Creek	0
Nanticoke/Wicomico Basin	**0**
Lower Choptank - 1997	0
Upper Choptank - 1996	0
Upper Choptank - 1997	0
Tuckahoe Creek - 1996	0
Tuckahoe Creek - 1997	0
Choptank Basin 1996	**0**
Choptank Basin 1997	**0**
Wye River	0
Corsica River	0
Southeast Creek	0
Upper Chester River	1
Chester Basin	**1**
Big Elk Creek	0
Northeast River	0
Elk Basin	**0**
Atkisson Reservoir	0
Bynum Run	1
Bush Basin	**1**
Little Gunpowder Falls	0
Loch Raven Reservoir	2
Prettyboy Reservoir	0
Gunpowder Basin	**2**
Back River - 1995	0
Back River - 1996	2
Baltimore Harbor - 1995	0
Baltimore Harbor - 1996	0
Jones Falls - 1995	0
Jones Falls - 1996	1
Patapsco River Lower North Branch - 1995	0
Liberty Reservoir - 1995	2
Liberty Reservoir - 1996	0
South Branch Patapsco - 1995	0

Table B-6. (Continued)

Watershed	Number of Blockages
South Branch Patapsco - 1996	0
Patapsco Basin 1995	**2**
Patapsco Basin 1996	**3**
Severn River	0
South River	0
West Chesapeake Bay	0
West Chesapeake Basin	**0**
Patuxent River (Lower)	0
Patuxent River (Middle)	0
Western Branch	1
Patuxent River (Upper)	0
Little Patuxent River	1
Middle Patuxent River	0
Rocky Gorge Dam	0
Brighton Dam	0
Patuxent Basin	**2**
St. Clement Bay	0
Gilbert Swamp	0
Zekiah Swamp	0
Nanjemoy Creek	2
Mattawoman Creek	0
Lower Potomac Basin	**2**
Potomac River (Upper-tidal)	0
Potomac River (Montgomery County)	0
Piscataway Creek	0
Anacostia River	0
Rock Creek	0
Cabin John Creek	0
Potomac Washington Metro Basin	**0**
Seneca Creek	0
Potomac River (Frederick County)	0
Lower Monocacy River	0
Upper Monocacy River	1
Double Pipe Creek	0
Catoctin Creek	0
Middle Potomac Basin	**1**
Potomac River (Washington County)	0
Antietam Creek	0
Conococheague	0
Sideling Hill Creek	0
Fifteen Mile Creek	0
Town Creek	0
Upper Potomac Basin	**0**
Potomac River (Lower North Branch)	0
Wills Creek	0

Table B-6. (Continued)

Watershed	Number of Blockages
Georges Creek	0
Potomac River (Upper North Branch)	0
Savage River	0
North Branch Potomac Basin	**0**
Youghiogheny River - 1995	0
Youghiogheny River - 1997	0
Deep Creek Lake - 1995	0
Casselman River - 1995	0
Casselman River - 1997	0
Youghiogheny Basin - 1995	**0**
Youghigheny Basin - 1997	**0**

APPENDIX C

PERCENTAGE OF STREAM MILES AND NUMBER OF SITES CHARACTERIZED AS DEGRADED FOR THE FISH AND BENTHIC IBI FOR SELECTED MARYLAND 8-DIGIT WATERSHEDS

Table C-1. Percentage of stream miles with a fish IBI score less than 3.0, the number of sites with a fish IBI score less than 2.25, and the number of sites with a fish IBI greater than or equal 2.25 and less than 3.0 for 8-digit watersheds with four or more 1995-1997 MBSS sites and for the 17 major drainage basins. Note that the total numbers for a drainage basin may exceed the sum of the numbers for the watersheds because watersheds with less than four MBSS sites are not included here.

Watershed	Percentage of Stream Miles with Fish IBI < 3.0	Standard Error	Number of Sites with Fish IBI < 2.25	Number of Sites with Fish IBI ≥2.25 and < 3.0
Deer Creek	30.18	17.26	0	4
Octoraro Creek	0.00	0.00	0	0
Conowingo Dam Susquehanna River	0.00	0.00	0	0
Broad Creek	38.55	38.71	1	0
Susquehanna Basin	**26.94**	**10.83**	**2**	**4**
Upper Pocomoke River	18.79	18.82	0	1
Pocomoke Basin	**9.72**	**9.72**	**0**	**1**
Lower Wicomico River	57.04	45.20	0	2
Nanticoke River	0.00	0.00	0	0
Marshyhope Creek	0.00	0.00	0	0
Nanticoke/Wicomico Basin	**18.06**	**11.59**	**0**	**3**
Lower Choptank - 1997	33.33	33.26	1	0
Upper Choptank - 1996	0.00	0.00	0	0
Upper Choptank - 1997	37.03	22.20	0	3
Tuckahoe Creek - 1996	0.00	0.00	0	0
Tuckahoe Creek - 1997	0.00	0.00	0	0
Choptank Basin 1996	**0.00**	**0.00**	**0**	**0**
Choptank Basin 1997	**33.53**	**16.67**	**1**	**3**
Wye River	50.00	30.52	0	2
Corsica River	0.00	0.00	0	0
Southeast Creek	20.00	19.84	0	1
Upper Chester River	13.85	13.98	0	1
Chester Basin	**26.17**	**10.82**	**1**	**5**
Big Elk Creek	0.00	0.00	0	0
Northeast River	0.00	0.00	0	0
Elk Basin	**21.01**	**14.27**	**0**	**2**
Atkisson Reservoir	39.72	23.49	1	1
Bynum Run	24.22	0.00	0	1
Bush Basin	**25.02**	**14.58**	**1**	**2**
Little Gunpowder Falls	0.00	0.00	0	0
Loch Raven Reservoir	23.51	11.26	3	2
Prettyboy Reservoir	0.00	0.00	0	0
Gunpowder Basin	**14.08**	**6.74**	**2**	**3**

Table C-1. (Continued)

Watershed	Percentage of Stream Miles with Fish IBI < 3.0	Standard Error	Number of Sites with Fish IBI < 2.25	Number of Sites with Fish IBI ≥2.25 and < 3.0
Back River - 1995	75.00	24.85	0	3
Back River - 1996	92.08	27.01	7	0
Baltimore Harbor - 1995	86.64	8.09	1	1
Baltimore Harbor - 1996	30.20	30.15	1	0
Jones Falls - 1995	15.86	9.91	0	2
Jones Falls - 1996	92.48	7.47	3	1
Gwynns Falls - 1995	57.46	0.00	0	2
Gwynns Falls - 1996	37.19	20.46	4	3
Patapsco River Lower North Branch - 1995	39.80	29.06	3	1
Liberty Reservoir - 1995	10.96	7.79	0	2
Liberty Reservoir - 1996	0.00	0.00	0	0
South Branch Patapsco - 1995	0.00	0.00	0	0
South Branch Patapsco - 1996	0.00	0.00	0	0
Patapsco Basin 1995	**23.05**	**6.90**	**8**	**6**
Patapsco Basin 1996	**31.60**	**7.79**	**12**	**10**
Severn River	22.13	13.69	1	4
South River	0.00	0.00	0	0
West Chesapeake Bay	25.29	9.69	3	3
West Chesapeake Basin	**20.80**	**8.70**	**5**	**7**
Patuxent River (Lower)	29.70	13.78	0	4
Patuxent River (Middle)	59.49	19.81	1	2
Western Branch	37.61	23.11	2	0
Patuxent River (Upper)	20.00	20.00	1	0
Little Patuxent River	62.12	17.87	4	4
Middle Patuxent River	0.00	0.00	0	0
Rocky Gorge Dam	37.23	37.19	0	1
Brighton Dam	54.87	17.43	1	3
Patuxent Basin	**39.99**	**7.16**	**9**	**14**
St. Clement Bay	34.12	20.82	1	1
Gilbert Swamp	22.24	22.04	0	1
Zekiah Swamp	12.02	12.01	0	1
Nanjemoy Creek	17.26	17.34	1	0
Mattawoman Creek	42.05	25.61	1	1
Lower Potomac Basin	**23.40**	**8.32**	**5**	**4**

Table C-1. (Continued)

Watershed	Percentage of Stream Miles with Fish IBI < 3.0	Standard Error	Number of Sites with Fish IBI < 2.25	Number of Sites with Fish IBI >2.25 and < 3.0
Potomac River (Upper-tidal)	0.00	0.00	0	0
Potomac River (Montgomery County)	46.85	18.31	4	3
Piscataway Creek	0.00	0.00	0	0
Anacostia River	34.34	20.66	2	4
Rock Creek	60.28	27.56	3	1
Cabin John Creek	53.91	38.96	2	1
Seneca Creek	1.64	1.63	1	0
Potomac Washington Metro Basin	**29.22**	**7.29**	**12**	**9**
Potomac River (Frederick County)	46.36	35.00	2	2
Lower Monocacy River	36.02	14.25	3	3
Upper Monocacy River	29.11	11.13	5	1
Double Pipe Creek	23.78	9.59	7	3
Catoctin Creek	66.67	42.10	1	1
Middle Potomac Basin	**33.60**	**6.63**	**18**	**8**
Potomac River (Washington County)	53.16	30.86	2	0
Antietam Creek	29.49	17.22	3	3
Conococheague	23.53	11.73	1	1
Sideling Hill Creek	43.31	37.12	1	1
Fifteen Mile Creek	30.58	9.54	6	1
Town Creek	10.98	5.46	2	0
Upper Potomac Basin	**32.32**	**6.87**	**18**	**7**
Potomac River (Lower North Branch)	87.08	30.78	8	4
Wills Creek	58.14	31.38	3	0
Georges Creek	74.09	26.46	6	0
Potomac River (Upper North Branch)	42.87	36.47	1	1
Savage River	0.00	0.00	0	0
North Branch Potomac Basin	**40.81**	**9.45**	**18**	**5**
Youghiogheny River - 1995	24.90	15.49	3	3
Youghiogheny River - 1997	21.44	11.13	4	0
Deep Creek Lake - 1995	16.12	4.93	3	0
Casselman River - 1995	22.69	18.74	0	2
Casselman River - 1997	3.86	4.29	0	1
Youghiogheny Basin 1995	**29.53**	**10.61**	**5**	**7**
Youghiogheny Basin 1997	**22.49**	**9.40**	**3**	**6**

Table C-2. Percentage of stream miles with a benthic IBI score less than 3.0, the number of sites with a benthic IBI score less than 2.25, and the number of sites with a benthic IBI greater than or equal 2.25 and less than 3.0 for 8-digit watersheds with four or more 1995-1997 MBSS sites and for the 17 major drainage basins. Note that the total numbers for a drainage basin may exceed the sum of the numbers for the watersheds because watersheds with less than four MBSS sites are not included here.

Watershed	Percentage of Stream Miles with Benthic IBI < 3.0	Standard Error	Number of Sites with Fish IBI < 2.25	Number of Sites with Fish IBI ≥2.25 and < 3.0
Deer Creek	2.90	2.13	0	2
Octoraro Creek	7.22	8.11	0	1
Conowingo Dam Susquehanna River	25.00	24.36	0	1
Broad Creek	0.00	0.00	0	0
Susquehanna Basin	**15.05**	**7.83**	**0**	**6**
Upper Pocomoke River	87.62	30.34	3	8
Pocomoke Basin	**87.78**	**13.15**	**5**	**14**
Lower Wicomico River	100.00	54.28	1	3
Nanticoke River	26.69	27.79	0	1
Marshyhope Creek	52.33	33.38	1	2
Nanticoke/Wicomico Basin	**59.95**	**18.56**	**4**	**5**
Lower Choptank - 1997	75.00	24.95	2	1
Upper Choptank - 1996	94.08	14.93	6	2
Upper Choptank - 1997	79.87	19.13	9	1
Tuckahoe Creek - 1996	52.07	33.37	3	2
Tuckahoe Creek - 1997	57.59	38.17	4	1
Choptank Basin 1996	**76.34**	**14.18**	**8**	**7**
Choptank Basin 1997	**77.31**	**14.21**	**9**	**8**
Wye River	50.00	30.52	1	1
Corsica River	29.07	29.79	1	0
Southeast Creek	93.20	6.74	3	2
Upper Chester River	48.08	17.66	3	1
Chester Basin	**63.67**	**13.22**	**11**	**5**
Big Elk Creek	24.85	24.65	0	1
Northeast River	86.97	11.34	2	2
Elk Basin	**67.02**	**19.81**	**4**	**8**
Atkisson Reservoir	40.89	19.86	2	0
Bynum Run	100.00	0.00	3	2
Bush Basin	**73.29**	**16.45**	**9**	**6**
Little Gunpowder Falls	13.46	13.43	0	1
Loch Raven Reservoir	7.79	6.90	0	2
Prettyboy Reservoir	37.43	37.40	1	0
Gunpowder Basin	**18.74**	**7.60**	**1**	**6**

Table C-2. (Continued)

Watershed	Percentage of Stream Miles with Benthic IBI < 3.0	Standard Error	Number of Sites with Fish IBI < 2.25	Number of Sites with Fish IBI ≥2.25 and < 3.0
Back River - 1995	100.00	0.00	4	0
Back River - 1996	100.00	26.18	8	0
Baltimore Harbor - 1995	91.86	8.09	1	2
Baltimore Harbor - 1996	69.80	31.56	2	1
Jones Falls - 1995	7.93	8.42	0	1
Jones Falls - 1996	84.97	0.00	3	0
Gwynns Falls - 1995	57.46	0.00	2	0
Gwynns Falls - 1996	97.16	2.80	7	4
Patapsco River Lower North Branch - 1995	66.50	18.74	6	2
Liberty Reservoir - 1995	12.04	6.15	1	2
Liberty Reservoir - 1996	54.80	20.65	4	6
South Branch Patapsco - 1995	43.86	34.56	0	2
South Branch Patapsco - 1996	39.37	14.68	5	3
Patapsco Basin 1995	**32.94**	**7.65**	**14**	**9**
Patapsco Basin 1996	**67.51**	**8.20**	**20**	**16**
Severn River	84.90	39.21	5	5
South River	100.00	37.71	2	2
West Chesapeake Bay	94.42	33.35	5	3
West Chesapeake Basin	**95.53**	**17.10**	**17**	**11**
Patuxent River (Lower)	54.03	13.10	3	4
Patuxent River (Middle)	59.49	19.81	1	2
Western Branch	93.38	19.84	6	3
Patuxent River (Upper)	100.00	0.00	2	3
Little Patuxent River	86.01	14.53	10	3
Middle Patuxent River	0.00	0.00	0	0
Rocky Gorge Dam	0.00	0.00	0	0
Brighton Dam	17.08	17.05	0	1
Patuxent Basin	**58.08**	**7.20**	**21**	**17**
St. Clement Bay	34.18	20.82	0	2
Gilbert Swamp	33.28	0.00	1	0
Zekiah Swamp	43.87	14.91	1	4
Nanjemoy Creek	51.79	23.65	1	2
Mattawoman Creek	65.25	24.85	0	4
Lower Potomac Basin	**42.73**	**9.74**	**3**	**14**
Potomac River (Upper-tidal)	100.00	0.00	4	0
Potomac River (Montgomery County)	43.47	18.62	2	4
Piscataway Creek	78.87	2.90	0	3
Anacostia River	88.87	20.85	12	2
Rock Creek	86.89	27.90	3	3
Cabin John Creek	100.00	0.00	4	1
Seneca Creek	38.36	13.40	2	4
Potomac Washington Metro Basin	**65.60**	**8.27**	**25**	**13**

Table C-2. (Continued)

Watershed	Percentage of Stream Miles with Benthic IBI < 3.0	Standard Error	Number of Sites with Fish IBI < 2.25	Number of Sites with Fish IBI ≥2.25 and < 3.0
Potomac River (Frederick County)	100.00	0.00	5	3
Lower Monocacy River	53.52	14.48	7	12
Upper Monocacy River	80.94	12.06	18	13
Double Pipe Creek	83.41	9.30	12	8
Catoctin Creek	45.14	32.88	1	1
Middle Potomac Basin	**71.56**	**7.25**	**43**	**37**
Potomac River (Washington County)	79.00	20.97	1	3
Antietam Creek	41.07	20.85	3	2
Conococheague	0.00	0.00	0	0
Sideling Hill Creek	56.69	37.12	2	2
Fifteen Mile Creek	33.98	15.16	0	3
Town Creek	10.98	5.46	1	1
Upper Potomac Basin	**41.29**	**7.80**	**9**	**14**
Potomac River (Lower North Branch)	20.99	14.25	1	3
Wills Creek	32.67	5.42	1	2
Georges Creek	100.00	5.53	5	2
Potomac River (Upper North Branch)	57.13	36.47	1	6
Savage River	3.12	3.13	0	1
North Branch Potomac Basin	**31.43**	**7.75**	**8**	**14**
Youghiogheny River - 1995	7.53	3.41	2	3
Youghiogheny River - 1997	14.29	9.65	1	2
Deep Creek Lake - 1995	6.10	0.00	1	0
Casselman River - 1995	3.42	3.38	0	1
Casselman River - 1997	8.37	6.96	1	2
Youghiogheny Basin 1995	**5.09**	**1.90**	**3**	**4**
Youghiogheny Basin 1997	**20.29**	**8.80**	**4**	**7**